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# TEACHING CHILDREN TO STUDY

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TO MY FATHER
JOSEPH EARHART
THIS BOOK IS AFFECTIONATELY
DEDICATED

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# PREFACE

THE problem of teaching children to study, towards the solution of which this volume is offered, was presented before a class in Teachers College, Columbia University, during the year 1905–06, by Dr. Frank M. McMurry, Professor of Elementary Education. It is largely due to his particular encouragement and assistance that the author undertook the special investigation of the problem of teaching children to study. To Professor McMurry, and also to Professors G. D. Strayer and Henry Suzzallo, both of Teachers College, a great debt is due for counsel and direction freely given during the years which this study has occupied.

The attempt to solve this problem necessitated the employment of philosophy on the one side, to establish the nature and function of study, and the use of experimental and psychological method on the other, to determine the ability of pupils to study logically and also the possibility of training them into correct habits of study. Schoolroom visitation and the *questionnaire* were also employed to throw light upon the teachers' ideas of

study, present practice in training pupils to study, and the ability of children to study. The field to be covered proved to be a very broad one, but interest grew as the work proceeded, not only because an entirely new light was thrown upon schoolroom procedure, but also because of the attitude of the teachers themselves towards the problem. Many expressed the earnest wish that results might be worked out which would bring help to them in their efforts to teach their classes.

To meet the needs of these teachers and others, the original report, "Systematic Study in the Elementary Schools," has been rewritten in fuller and simpler form so as to make it more usable and helpful; the present book is the result. It carries the author's greetings to her companions of the schoolroom.

Those who desire details in regard to the experiments and *questionnaires*, and who care to consult the tabulated results, are referred to the book "Systematic Study in the Elementary Schools," Bureau of Publication, Teachers College. Other books bearing upon special phases of the subject are referred to in the text.

L. B. E.

# EDITOR'S INTRODUCTION

*The failure of the reactionary*

THERE is a feeling that our schools are over-burdening our children with subjects for study, and that a kind of superficial training results. Many believe that we ought to return to the simple curriculum of our colonial fathers, to fewer subjects and more particularly to those which are sometimes called "fundamentals," — reading, writing, arithmetic, and the like. This species of discontent has been noticeable for more than a decade. Yet in spite of every form of opposition, the newer subjects of the course of study persist. The reactionary has failed to make any considerable headway. New aspects of training, even, have been added to the school's functions.

*The latest conscious function of the school*

Of the new functions which the school is consciously assuming, there is one which promises to be epoch-making in the development of teaching methods. The deliberate effort to teach children to study is more than an addition to the school's tasks; it is a change in the emphasis of

school instruction. Hitherto the teacher has spent most of his time in transmitting to the child the symbols of language and the facts of knowledge. To teach the child to read, to write, to figure; to make him memorize the important facts of history, geography, and literature, — such were the functions of the elementary schools till within recent years. Hereafter the school bids fair to devote its best energies, not to memorization, but to teaching the child how to think, how to direct his own conduct intelligently, how to study without constant dependence on the teacher. In the old school the teacher did the thinking and most of the talking, while the child did the memorizing. In the new school the child will do the thinking and most of the talking, while the teacher will restrict himself to a thoughtful stimulation and direction of the process.

### *Its effect on the crowded curriculum*

To those who would loudly decry the addition of a new function to the school, it may be said that such an addition does not imply a new burden for the child and the teacher. In the specific case of teaching children to study it implies relief from the over-crowding of school life, rather than further congestion. If a child learns how to

direct his observations, to read his books, to organize his facts, and to apply his knowledge, the school is no longer responsible for teaching him every fact for which life will call. He has power equal to his needs as they confront him in life. Now that he knows the uses of his mind and his books, he can make up any chance defect. His days of learning do not end with graduation from school. Under such conditions as these the demand of the course of study will be less for all the facts of a subject than for the typical ones. The independent qualities of mind required to understand and comprehend them will provide the rest.

### *Purpose of this monograph*

The newness and the importance of the movement for teaching children to study require that teachers and parents be competent to supervise the learning process. They will need to know the nature of independent thinking, its various modes, the conditions favorable to its development, and the methods by which it may be strengthened as a personal power. The monograph here presented will be of large service to all who are interested in the problem. It is based upon extensive investigations of children's habits of mind under

classroom conditions. It is rich in suggestions as to concrete ways in which pupils may be brought to a high degree of ability in the self-direction of their intellectual inquiries. It should, more than any other document now in print, aid teachers in their efforts to train self-reliant men and women.

# THE NATURE OF LOGICAL STUDY

# I

# THE NATURE OF LOGICAL STUDY

## 1. *The universal necessity for study*

THROUGH the whole course of our lives we are confronted with situations the successful mastery of which compels mental effort. Whether the tasks laid upon us are assigned in school or outside of school, and whether we wish to do so or not, we must struggle mentally. In the sense that it gives us frequent occasion to study, life itself may be called a school. In this school all are enrolled, from the youngest child to the wisest philosopher. Whittier indicated a few of the out-of-school lessons in his poem, "The Barefoot Boy": —

> "Knowledge never learned of schools,
> Of the wild bee's morning chase,
> Of the wild-flower's time and place,
> Flight of fowl and habitude
> Of the tenants of the wood;
> How the tortoise bears his shell,
> How the woodchuck digs his cell,
> And the ground-mole sinks his well;

How the robin feeds her young,
How the oriole's nest is hung;
Where the whitest lilies blow,
Where the freshest berries grow,
Where the ground-nut trails its vine,
Where the wood-grape's clusters shine;
Of the black wasp's cunning way,
Mason of his walls of clay,
And the architectural plans
Of gray hornet artisans!"

Some thousands of years ago a number of problems in the form of a series of questions were proposed which the scientists and philosophers have not yet worked out to a final conclusion. The series begins thus: "Where wast thou when I laid the foundations of the earth? declare, if thou hast understanding. Who hath laid the measures thereof, if thou knowest? or who hath stretched the line upon it?"[1]

The present age is full of problems, some of them inherited, and some peculiar to itself. We find people occupied in determining how to reach the north pole, how to navigate the air, how to prevent and cure diseases, how to earn a living, how to keep expenditures within the bounds of one's income, how to train and educate children, how to square conduct with ideals, and how to

[1] Job xxxviii.

solve innumerable other puzzling questions of varying importance.

### 2. *The inadequacy of instincts to solve problems*

Because human beings are not born with a full set of fixed instincts which control their activities in every circumstance when action is required, it is clear that people must often think about what they do. They must determine how they shall act and what associations of ideas they shall make. For example, there is no instinct which will carry us inevitably into our life-work, nor which, when we have chosen our careers, will determine the means by which we shall pursue them successfully. Neither does instinct settle the general question as to whether honesty or dishonesty is better on the whole, or which of the two is better in some particular case. We are all compelled to be students since we cannot dismiss our problems at will and lead that careless existence which is something less than real living.

### 3. *The need of learning how to study*

Among the subjects of study with which people might profitably occupy themselves, there is one of great importance which, as yet, has received little consideration, and that is the process of

studying itself. Unless by nature we study in the right way, we must either be taught to do so, or else there will be waste of energy, loss of time, and sometimes either incorrect results, or no results at all. Investigation shows that neither children nor adults naturally study as they should. The right method must be learned in some way, if it is acquired at all. Individuals must either work out a method for themselves, more or less consciously, or they must be taught how to study by others who have already learned.

### 4. *The nature of study*

We are confronted, then, by these two conditions: (1) that all people have occasion to study, and (2) that people on the whole do not study as well as they should. If we attempt to meet the situation by teaching people how to study, we at once find that we must be acquainted with the nature of the process before we can teach it. We need to know the basis of it and the various steps involved in it before we can train others in its use. This is the problem which confronts parents and teachers, since they are the ones who must teach children how to study, and it is for parents and teachers that this book is mainly intended.

First of all, some definition of the term *study* is

necessary in order that misunderstanding may be avoided and that we may know our problem definitely. Studying in its highest sense is the process of assimilating knowledge, of reorganizing experience. As ordinarily employed, the term studying often means much less than this, and includes any mental activity directed towards the accomplishment of some end, whether that end be the memorizing of facts in a geography lesson, the learning of a story in reading, or the mastering of a list of words in spelling. In this common usage of the word it includes the mind's activity that is directed towards the acquisition of ideas, whether these ideas become an organic part of knowledge or not. Learning dates in history, and committing poems and definitions to memory do not always involve the assimilation of knowledge, yet teachers call the effort to accomplish these tasks by the same name that is applied to the mental efforts of a philosopher who is engaged upon some weighty problem. The two kinds of studying are quite different. The one is more mechanical than the other and results largely in accretion of facts. The other is organic and results in rearrangement and assimilation of ideas; in short, it involves thinking. It is this latter form of mental activity, which is generally acknow-

ledged to be of a higher type than the first, that is the object of investigation and discussion in this book.

When teachers are asked what they think studying is, many of them say that studying means to imagine, to memorize, to apperceive, to think. In other words, they mean that studying is a psychological process. But these answers do not furnish much of a clue to the proper method of teaching people how to study because they do not show when or how one shall imagine, memorize, apperceive, or think. There must be some other explanation of the process than an enumeration of the psychological states that may or may not be involved, if we are to understand it fully and to be able to teach it intelligently. This explanation we shall now seek.

### 5. *The kind of thinking employed in studying*

It has been said that proper study involves thinking. The thinking which is employed in studying is reflective or purposive as distinguished from spontaneous thinking. In the latter sort, the ideas are not controlled by the thinker. They come and go at random. But in reflective or purposive thinking, there is a definite end in view and the ideas are selected and controlled so as to

accomplish this end. When a person gives the rein to fancy and lets his thoughts wander where they will, his thinking is of the spontaneous kind; but when he sets himself to accomplish some task, to solve a problem, or to find the way out of some difficulty, he controls his thoughts and chooses or rejects the ideas which come into consciousness, taking as the basis of his choice the bearing which these ideas have upon the end he is trying to reach.

### 6. *The origin or source of the problem*

It is just this consciousness of some end in the form of a problem which causes the thinking and governs its course. In the determination of this problem lies the logical basis of study; hence it is important to know whence and how it is derived, and by whom it must be felt as a problem if it is to influence thought.

#### a. *Failure of habitual modes of thought and action*

Problems frequently arise because for some reason our habitual ways of acting or thinking cannot be employed. An entirely new situation, or some change in an old one, may break up our usual way of doing things, and compel us to seek for a plan of action that will meet the new conditions. A

flood, a fire, a financial panic, the loss of some tool or utensil, a blockade of the street-car system, the stopping of a watch, the increased cost of foodstuffs, — any one of these may prove a serious problem and compel thought in order to master the new situation. Such apparent dilemmas arise frequently in connection with nature study, geography, arithmetic, and other school studies, as well as in connection with the formal routine of schoolroom procedure. For example, a child's idea of a desert is frequently found to be that it is a place where nothing can grow. When confronted with the statement of the fact that certain places, hitherto deserts, are now very productive, he is face to face with a difficulty which should furnish him with a valuable problem. The pupil who comes upon a verbal noun for the first time may find that it puzzles him to classify it properly as a part of speech. Similarly in arithmetic, there are problems varying sufficiently from those already mastered to cause the degree of thought needed to analyze and master them.

b. *The need of relating new knowledge to old*

Sometimes the problem originates in the attempt to relate some new fact to the knowledge already possessed, as in the case of the pupil and

the verbal noun just referred to. The significance of the new must be seen before it is of use to the individual who acquires it. "What is the use of this object or idea?" "What is the purpose of this?" "What difference will this make in my ways of doing or thinking if I accept it?" All such questions look forward to purpose or end. Or, instead of looking forward to see the effects which the new ideas will produce, one may seek out the cause or explanation of them in previous knowledge. Washington was made commander-in-chief of the American army at the time of the Revolutionary War. That is the new fact learned. Why was he elected to that position? With the ordinary class, this question compels a review of Washington's character and career in order to find the reasons for his selection for so important a position. The warmer air in a room is found near the ceiling. Why? Frequently the explanation is to be found in ideas already possessed by the observers.

### c. *Conflict of ideas*

Sometimes two sets of ideas or lines of action seem so contradictory that it is difficult to decide which is true and therefore the one to choose. In political campaigns, different speakers will advise

for or against the election of a certain man, according to their political bias, and will present on one side strong arguments to show that he is in every way desirable, and on the other, will give what seems convincing evidence that he cannot safely be trusted with the political office in question. Which side is right?

Again, when one is trying to decide upon a plan of action, arguments present themselves both for and against almost any course proposed. From one point of view it is very desirable to follow a certain plan of conduct; while, viewed from another standpoint, this same plan seems unwise. "To be or not to be. That is the question." This conflict of ideas extends to the mastery of school subjects. When it is a matter of finding explanations for facts observed in science lessons, of selecting the right method of solving some problem in arithmetic, of determining the right way to dispose of some part of a sentence in grammatical analysis, of making the correct interpretation of the thought of some author in the study of literature, the opportunities for conflicts are numerous. There is frequent occasion for the explanation and reconciliation of apparent opposites.

### d. *Curiosity as a source of problems*

A prolific source of problems, whether in school or out of it, is curiosity. We wonder *why*, or *how*, or *what*, and reach out in other directions for more knowledge. This curiosity may be of an idle, fleeting kind, which, left to itself, would result in little effort and progress. It may be of a primitive nature, not being based upon previous knowledge. A teacher appeals to primitive curiosity when he leads his class to desire to hear a story they have never heard before, or to see something new. He arouses expectation and desire which are directed towards unknown objects. Rightly valued and employed, however, curiosity may be made a valuable agent in education. Intelligent curiosity, which is based upon partial knowledge, which reaches out to some definite end, and which leads to some adequate method of attainment of that end, cannot be overestimated as a means of development and training. Consequently the suppression of curiosity just because it is curiosity, or the rejection of a method just because it appeals to curiosity, is short-sighted. The appeal to curiosity is justifiable, but it should lead to some intelligent end, and not remain upon the level of mere idle wonder. A teacher may

have in view the teaching of an important lesson in some subject; she may lead the children to approach it by appealing to a curiosity initially connected with some superficial fact. The explanation of that fact leads into the subject step by step, until, when the lesson period is over, the teacher's aim is accomplished. A lesson on glaciers may begin with the observation of markings on rocks, or the discovery of boulders in the soil. The question arises, "How did they come to be there?" and in answering it the subject of glaciers is taught. A comparative study of cotton and wool might be introduced by the question as to why wool was used before cotton for making cloth. Similarly in other subjects, some fact may be brought to the attention which provokes the curiosity and tends to direct thought into desired channels.

### e. *The necessity for activity*

Not only does the need of knowledge, apparently for its own sake, frequently give rise to problems, but also the need of knowledge for the sake of some activity which is to be based upon it may become the source of careful thought. What to do, how to do, how to improve the execution of some process, — these are problems fre-

quently met, and their solution often includes the physical expression of the theory evolved. Drawing, painting, manual training, physical education, games, and all other subjects involving bodily activity provide problems of this kind. Drill for rapidity and accuracy in arithmetic or geography calls for the same sort of treatment; that is, knowledge of the process, and repeated and intelligent exercise in its use. In all these situations involving physical activity, thinking is necessary to determine the cause of the difficulty, to select the means to overcome it, and to judge of the efficiency of the latter when they are employed. They are therefore to be classed as thought-provoking situations, as sources of problems.

### f. *Feeling as a source of problems*

The value of feeling as a spur to the discovery of problems should not be overlooked nor lightly estimated. As already shown, curiosity leads to the recognition of limitations both of knowledge and of skill, and so brings to consciousness a tension in experience which leads to study. The negative side of the importance of feeling has often been recognized by teachers in inducing pupils to work in school. They threaten

various unpleasant consequences which will be visited upon those who do not complete their work in a certain manner, or before a specified time. The pupils, in order to avoid these consequences, bend their unwilling energies to their work and strive to master it. There are many instinctive feelings, both pleasant and unpleasant, which find their outlet in ways which demand either new knowledge or some change in the usual modes of activity. Some of these instincts are sympathy, sociability, friendship, pugnacity, emulation, love of praise, hatred, jealousy, envy, love of self, and love of physical activity. In addition to the instinctive feelings, there are both feelings and attitudes which are the result of cultivation. But whether instinctive or acquired, these emotive states influence both the origin and outcome of the thought-situation which constitutes the problem for study. Sympathy, friendship, envy, hatred, love of mental or physical occupation, — these states of mind, if strong enough, seek appropriate expression, and the question of ways and means arises. Or, if the problem does not arise in the feeling itself, but is accompanied by a strong feeling of some kind, the energy put forth to accomplish this end is influenced. If a boy is sure that something in grammar or arith-

metic is worth having, and that it bears upon some felt need, whether of his own or of the society in which he is interested, he will put forth more intense and continuous effort than he otherwise would. When there is an accompaniment of pleasant feeling of some sort, the fatigue is felt less than when the problem is regarded as a useless task.

### 7. *The aim of study*

Whether the occasion for thought lies in the need of knowledge or of activity, or in the necessity for expressing some emotive state, the aim is to readjust experience so that tension or friction shall disappear and harmony prevail. Each specific situation presents its own peculiar incentive to thought and furnishes the occasion for its exercise. It is clear that the thinking thus occasioned cannot be of the spontaneous kind, but must be selective, purposive in its nature. Its course, too, is not complete until the validity of its results has been tested in some way. Conclusions and theories must be tried by further experience before their validity can be affirmed positively. When, however, their use has become habitual so that they have reached the mechanical stage of application, they present no further

aim to thought, and the problem is regarded as solved; that is, the studying is completed.

8. *Thinking, memorizing, and habit-forming*

In this connection, the relation between thinking and memorizing, and thinking and habit-formation should be noted. In thinking, ideas are associated according to their meaning, and when the process is ended, memorizing is at least partially accomplished, and that, too, in its best form. Reviewing the associations thus established completes the process. This is rational memorizing as distinguished from that which is purely mechanical. In habit-forming, thinking may be very prominent during the first stages. The form of activity to be learned, the way of responding to a certain situation must sometimes be chosen as the result of reflection, and progress in efficiency must be watched with care until the mind is freed from conscious oversight of the process. Learning long division is a typical form of habit based upon thinking. Each step is thought through carefully, and then thoughtful repetition brings mechanical accuracy.

### 9. *The relation of the problem to the person who is to study*

It is self-evident that in normal conditions the tension, the lack of harmony, or want of completeness must be within the experience of the person or persons who are to do the thinking, since the thinking arises from personal motives. A thing is of interest and worth doing, and demands to be done because in some way it affects our own welfare and the equilibrium of our ideas. Professor James, in discussing interest, says: "You will understand this abstract statement easily if I take the most frequent of concrete examples — the interest which things borrow from their connection with our own personal welfare. The most naïvely interesting object to a man is his own personal self and its fortunes. We accordingly see that the moment a thing becomes connected with the fortunes of the self, it forthwith becomes an interesting thing. Lend the child his books, pencils, and other apparatus; then give them to him, make them his own, and notice the new light with which they instantly shine in his eyes. He takes a new kind of care of them altogether. In natural life all the drudgery of a man's business or profession, intolerable in

itself, is shot through with engrossing significance because he knows it to be associated with his personal fortunes."[1] If the problem is to have interest, and is to be a motive power to the child, it must grow out of his own experience, some situation in relation to himself, otherwise no genuine thinking will result.

For a teacher in the elementary schools to assign a lesson without first preparing the class so that the pupils go to their work with a definite problem in view, and that problem one which touches them vitally, one which they have some interest in accomplishing, is to invite mechanical memorizing, and that, as has been said, is not study in the higher sense because it is not the assimilation of knowledge. When the teacher gives the problem to the class, which is usually the case when there is any aim present at all, the pupils may have a motive for thoughtful work and they may not. It depends upon the extent to which they recognize the problem as valid for them, as involving their own needs, as possessing personal interest, as presenting a situation which they accept as theirs. Thoughtful study will depend upon their appropriation of the problem as given by the teacher. But if the teacher can so

[1] James, *Talks to Teachers*, pp. 94, 95.

direct the experience of his pupils that this problem arises in their own consciousness of need, then it is felt to be theirs and the situation is most favorable for thinking.

### 10. *The need of definiteness in the aim*

Another point of importance to note in regard to the problem is the fact that it should be as clearly defined as possible before its solution is undertaken. To be aware that there is a crisis or tension in experience is one thing; to have analyzed the situation so as to see just where the difficulties lie is quite another; and to determine possible modes of accomplishing the solution is still another. It is as if a person, who had seen a long pendulum set swinging in a north and south direction, should discover after several hours that the record shows a change in direction, and being puzzled, should ask, not "Why does it swing?" because he saw it set in motion, but "Why, having been started to swing in one direction, does it now swing in another?" Probably several answers suggest themselves, some to be rejected at once as manifestly contrary to fact and consequently impossible. Only those hypotheses are accepted tentatively for investigation which show some possibility of furnishing an adequate solution.

It may be necessary to look into the nature of the problem itself before a solution is sought. Analysis is employed to discover its meaning and its implications; and reflection, reading, investigation may be required to make clear what is to be done, and the ways by which the solution is to be attempted. This process of defining the problem and formulating hypotheses for its solution may require a very short time, or it may occupy an extended period. Children's guesses as to what things are, or why things are so and not otherwise, are simply childish hypotheses intended to meet natural situations. The trouble with their studying is that they frequently end their mental efforts with the mere formulation of their problems, rather than accept such formulations as starting points on the way to positive knowledge. The clear understanding of the problem furnishes the criterion for the acceptance or rejection of material, and for its organization. The keener the individual's sense of need, and the more intense his desire to acquire a certain body of knowledge, the clearer his statement of the problem will probably be, and the more definite his demand for what he wants.

### 11. *Recognition of the problem the first factor in logical study*

This recognition of a problem is a factor in proper study, that is, in study in the sense in which we are here considering it; and since it precedes the other steps, it may be called the first factor in study. The problem must originate within the experience of the students, or be appropriated by them in order to arouse thought, and it must be defined clearly in order to furnish a definite guide to thought.

### *General Summary*

The points presented thus far are as follows: (1) The necessity for study is universal, as is also the need of being taught to study properly. (2) Studying, in its higher meaning, is mental activity directed towards the assimilation of ideas, the reorganization of experience. (3) Proper study involves purposive thinking, since it is thinking that is directed toward some end. (4) Back of the psychological steps involved in studying is the logical basis of the process. This is the tension in experience which constitutes the aim or purpose of thinking, and furnishes the criterion for the acceptance or rejection of ideas in the at-

tempt to readjust experience. (5) The recognition of a problem is the first factor in proper study. (6) This problem must be felt as such by those who are to study, or else the motive and guide for thought are lacking. (7) In order that the thinking may be accurate, the problem must be clearly defined in the mind of the person who is to do the thinking. Its requirements must be plainly perceived, and some hypothesis formed as a tentative explanation. This hypothesis determines the direction which the solution of the problem will take. It should conform to known facts. It should have some reasonable basis.

NOTE. — For a fuller discussion of the ideas in regard to the thought-situation presented in this chapter, see *Studies in Logical Theory*, by Professor John Dewey.

# THE NATURE OF INDUCTIVE STUDY

# II

# THE NATURE OF INDUCTIVE STUDY

## 1. *The distinction between inductive and deductive study*

The difference between inductive and deductive study is the same as the difference which exists between induction and deduction whenever they are employed. When a person studies deductively he seeks to solve his difficulties or satisfy troublesome situations by employing principles, rules, or some other form of generalized knowledge which he already possesses. In inductive study, on the contrary, the generalization, whether it be definition, rule, or principle, must be discovered by the student before he can apply it to the solution of the problem upon which he is engaged. This latter form of study always originates in a relatively concrete situation and tends towards the formation of some general idea or concept which will explain the problem that set the thinking process in motion, so to speak. As

will be shown in the following chapter, deductive study may begin either with the data or with some generalization. Inductive study may begin with data or with an untried hypothesis. It cannot begin with a logical generalization or concept, since these are the result of the inductive process itself and therefore cannot be the starting point.

### 2. *Collecting data a factor in inductive study*

When in the course of experience such a problem as has been described in the preceding chapter becomes a part of consciousness, it controls the nature of the mental process which succeeds it, unless it is inhibited from so doing. One of the most prominent aspects of this process is the gathering of material bearing upon the problem in hand. This collecting of data is a most important factor in study, for through its agency we are furnished the means whereby we may prove, amend, or reject the hypotheses formulated for the solution of the problem, and arrive at more definite theories.

The material brought together for these purposes may be drawn from several sources. It may be a part of previous experience that is recalled. Information may be gained from others by inquiry or through reading. It may be gained

through the processes of experimentation and observation.

### a. *Memory a source of data*

The data culled by memory out of past experience possess varying degrees of value. Even though the ideas relating to the new problem were originally gained by means of direct observation, they may be incomplete because the present problem was not in existence at the time the observations were made, and so exercised no influence upon them. In consequence, the ideas lack fullness and clearness and are not to be trusted entirely. Loss of time and the presence of other mental states tend to weaken ideas, however complete and clear they may have been originally. In looking over their old letters or diaries, people sometimes find that their memories of past events have changed radically from the record made at the time the events occurred. Furthermore, the very attempt to recall past experiences in the light of a present problem favors the activity of the imagination, so that ideas are not recalled exactly as they were. Changes are made, sometimes quite unintentionally and unconsciously, so that it is difficult to say where recollection ends and imagination begins. In spite, however,

of all these drawbacks to memory as a source of data, the past must be searched frequently to discover what contribution it can make to present crises in experience; but it is sometimes necessary to scrutinize the ideas thus obtained to see whether they are correct and complete. The following instance will show what is meant by incomplete observations and the interference of the imagination. When asked what becomes of the blossom of the dandelion, the students in several classes tried to recall their observations of that flower. All remembered the flower in bloom. Some remembered that the flower closes after blooming, but some had never noticed that fact, and some had forgotten it. All remembered the fluffy white head that appeared later. Not more than one or two had noticed what becomes of the blossom. In every class, several ventured the reply that the yellow flower turns into the fluffy white ball, — an imaginative reply built upon incomplete observation.

b. *Group-experience a source of data*

When memory fails to furnish the data necessary to solve the problem in hand, the individual may try to make up the lack by referring to his classmates, to his teacher, if he be a student in

school, to the members of his family, or to any others who he thinks may be in possession of the ideas he needs. The value of resorting to group experience to supplement or correct individual experience should be recognized by the teacher, and pupils should be encouraged to seek information bearing upon their problems from one another, from parents, or from others who may be able to supply it.

In addition to one's own knowledge and the knowledge of the social group, the knowledge that is stored in books constitutes an important source of data. In many schools it is almost the only source utilized, the experience and knowledge of the pupils and of the society in which they live being quite or almost disregarded. The books should not be neglected, but teachers ought to consider the question whether they should always be the first resort in looking for data, or whether they should sometimes be left in the background until other sources have been utilized.

### c. *Experimentation and observation as sources of data*

In addition to the means already given for obtaining ideas relevant to the problem to be solved, the field of experimentation and observation fur-

nishes abundant data of the greatest value. Observations made *for a definite purpose* are more complete and accurate than mere casual, purposeless perceptions. The same may be said of experiments. There is a vast difference existing between study *about* nature and study *of* nature; between study *about* machinery and study *of* machinery; between study *about* the function of adverbs and study *of the use* of adverbs as they occur in literature or in spoken language. Experimentation and observation may not always be practicable, but the fact that the field work in geography, agriculture, nature study, and arithmetic is increasing shows that more can be done than has been done. The difficulty has been that teachers have not recognized the value of direct observation, or have hesitated to make the trial of conducting experimental or observation lessons. In solving problems, the experimenting or observing may be done by one pupil or by a group. Individual assignments and group assignments are both valuable, and the pupils can work out their results and report to the class. Opportunities for such assignments occur frequently in connection with the subjects studied in school. In geography, facts about clouds, winds, evaporation, condensation, and precipitation can readily

be observed. In arithmetic, the actual measures are frequently used by pupils. In higher classes, tax receipts, household bills, insurance policies, checks, and notes are sometimes found, but should be used to a much greater extent than is now the case, since the pupils can gain the facts about them from direct observation. The pupils themselves can obtain much of the material needed, and for their own sakes they should be encouraged to secure and study it. The wise limits of the use of observation and experimentation as sources of data bearing upon problems to be solved by pupils have not yet been reached, and the teachers of children have a problem of their own in studying the questions of when and how they should be resorted to by pupils who are trying to study independently.

d. *The teacher as a source of information*

In connection with the subject of gathering data several questions are heard frequently. A common one is, Shall the pupils always be expected to find the materials or information needed, or shall the teacher sometimes tell? When the cost in time and effort would outweigh the benefit to the pupils either in the knowledge or experience gained, or when the sources of informa-

tion are too difficult for the children to master with a reasonable amount of effort, the teacher should give the information to his class. There is a time to tell and a time to refrain from telling, and the teacher must distinguish between the two.

e. *Lectures versus books as sources of data*

Another question heard sometimes is in regard to the relative merits of lectures and text-books for students who are advanced enough to listen to lectures. Students sometimes expect and desire the instructor to pour out the subject to them in lecture form, and object to being sent to books or other sources to acquire it through their own research. If studying means the realization of a problem and reflection upon it, then books offer a better opportunity for study than do lectures. While one stops to reflect upon some point which a speaker has made, he misses the succeeding portion of the lecture. The case is different with a book. One's attention may be challenged by some problem, and during all of the succeeding study the text waits for the student and he is not losing the following thoughts. When he is ready to go on, the subject matter is there. An instructor must sometimes resort to lectures to

present material obtainable in no other way or for the reasons already given above in regard to telling things to children, but on the whole these are exceptional cases. For pupils in the elementary and high schools especially, the lecture should be the exception and by no means the rule.

The procedure is better from the point of view of the mental activity of the class, when, instead of the uninterrupted lecture, opportunity is given at times for inquiry and discussion by the students. Then the lecture, like the book, halts until doubtful points are made clear, wrong ideas are corrected, and the material offered becomes part of the student's data with its value duly recognized.

### f. *The use of original sources by pupils*

Since the use of classics has superseded the old school reader with its fragmentary selections, and since it has been found that pupils can read and enjoy entire literary productions, the idea has been advanced that pupils can profitably make use of source material in the study of history, instead of depending entirely upon the accounts given in school histories. It is doubtless true that objects and places of historical interest, letters, diaries, reports, and other official documents, as

well as the literature of the period under investigation, may be used much more extensively than they now are, and that the data derived from such sources may have much greater value than those derived from the school texts. Pupils ought to know from what sources historians derive their materials and how histories are prepared. They should also have practice in finding data in original sources and in selecting and interpreting them when found. The matter may easily be carried to the other extreme, however, and too great a burden put upon pupils both as regards the amount of time required and the difficulty of the materials to be used. Experienced historians are doubtless perplexed at times in determining the significance of historical materials; therefore too much in the way of sifting evidence and drawing conclusions should not be exacted of immature pupils. Carefully prepared texts adapted to the ability of the class will long have their place in education for the reason that they put data within the reach of the pupils in an economical form; but study of original sources should be encouraged within those bounds of time and ability which experience determines to be proper. Probably very few teachers will carry their use to an extreme; the error is more likely to be on the side of neglecting them.

### g. *The fallacy of relying habitually upon one source of data*

All the resources at our command should be drawn upon in the effort to solve our problems, and in general, it may be said that too great a reliance upon any one source is unwise. The person who knows nothing but books and the person who relies entirely upon his own observations are both depriving themselves of material that is valuable; so also does the person who is content with what he already knows as the basis for the solution of problems which arise in his life. There is a one-sidedness in such an attitude which defeats the very purpose of thought, that is, the discovery of truth.

### h. *The rejection of irrelevant data*

It frequently happens that in this gathering of data, many ideas enter consciousness which are not relevant to the problem and which, therefore, must be rejected; but having clearly defined the problem in the beginning, the sorting process is simplified. We cannot prevent the obtrusion of these irrelevant ideas, and it is consequently all the more necessary to learn to discriminate between that which bears upon the problem and that

which does not, and to accept or reject accordingly. For example, if a person plans a trip to Europe, the details of other trips are recalled or read, or they may be suggested by friends. Many of these ideas will doubtless be valueless, because they have no bearing upon the problems of the proposed trip, while some may be very helpful. Unless the prospective traveler can sift out the latter and neglect the rest, he will probably do some foolish things, and neglect certain wise preparations for his journey.

i. *The necessity of having data representative*

A consideration of very great importance in regard to data is that they must be gathered from such a number and variety of individual instances as to be sufficiently representative, and hence reliable. For example, data in regard to the physical measurements of Europeans would be very unreliable if obtained from the Anglo-Saxon nations alone, even though many individuals in those nations were measured. And similarly, measurements to be representative of the English should include all classes of English and not merely a selected group. Likewise, to base all study of the phenomena of the adolescent period upon observations limited to high school students would be

manifestly unscientific, since high school students are a selected group. Only a small per cent of pupils entering the first grade ever enter high school. There is a weeding-out process all along the elementary school course, so that by the time the high school is reached, those who have survived are a chosen few. Studies based upon them alone would not be truly representative of all young people of the same age. It is thus important to remember, in considering the reliability of data, that they must represent enough individuals and classes to make conclusions based upon them valid.

Summary: The collecting of data is a factor in logical study. Significant facts may be brought into consciousness by recall, by conversation with others, by reading, by experimenting, or by observation. It is unwise to depend upon any one course exclusively. These ideas, however gained, must be judged on the basis of their relevancy to the problem, and accepted or rejected accordingly.

### 3. *The organization of ideas a factor in inductive study*

A very important element in inductive study is the grouping of related ideas. It is a natural process for ideas to become associated in groups,

but in purposive thinking this process must be consciously aided. The ideas accepted because of their bearing upon the problem are examined to discover the nature of their relations to one another. Certain elements of similarity cause certain ideas to form a group, as when concepts are formed. Other ideas are attracted to one another because of the similarity of the relationship which they bear to some other idea. The idea of the navigation laws and the idea of the tax on tea are very dissimilar in nature; but because they both bear a functional relationship to the idea of the Revolutionary War, they are frequently associated in people's minds. Then there is the causal relationship among ideas, when the value of one idea depends upon the value of some preceding idea or series of ideas. For example, the idea of weather-of-a-certain-kind becomes associated with the idea of wind-blowing-from-a-certain-direction. Also, in studying parts of speech, the idea of pronoun becomes associated with the idea of noun because of their logical relationship. These relationships of similarity, of function, of cause and effect, and of place in a logical series, all of which are of importance in the solution of the problem on hand, should be sought out and established. The natural tendency to associate must be sup-

plemented by conscious effort. Furthermore, as a matter of convenience and clearness in dealing with ideas, it is frequently helpful, especially with a long or difficult problem involving much material, to prepare a classification showing the main topics arranged in order, with the subordinate points properly grouped under them. In most of the situations which present us with some problem, no such formal classification is necessary, but undoubtedly much incoherence and lack of logical treatment would be overcome by the more careful arrangement of material employed in attempting to work out some hypothesis.

### 4. *The results of the selection and organization of data*

As a result of the selection and organization of data, the hypothesis, which in the beginning was merely a more or less intelligent guess, is much more positive in its nature and has become a theory. Starting with an hypothesis based merely upon the facts immediately connected with the problem, there has been a wide search for data, a careful elimination of the irrelevant, and an organization of that which has been found to bear significantly upon the solution of the problem. During this process, the original hypo-

thesis may have been altered, rejected, or confirmed as a whole or only to a certain extent. For example, the pupils who in the beginning of a recitation hazarded a guess as to what a verb is, ought to be able to correct any error in the guess or to show wherein they were correct in their statements. Without these two steps, collecting and organizing, the hypothesis would have remained a mere guess. Both hypothesis and theory must be looked upon as tentative conclusions and must be put to the final test of application before being accepted as principles.

5. *Scientific doubt a factor in inductive study*

In the paragraph on the selection of data, it was said that data relevant to the solution of the problem should be accepted. This statement must be modified somewhat. The data must be not only relevant, but reliable. Whatever is accepted should be accurate. It frequently happens that material is presented in the working out of a situation which would apparently meet every difficulty, but it lacks the most necessary characteristic, — that of accuracy. If the problem to be solved is of any importance to the person who engages in its solution, it is obviously of considerable importance to that person that he accept

none but reliable data. He must, then, scrutinize with care that which he accepts, and his attitude in general must be that of doubt. The greater the significance of the problem the more important doubt, scientific doubt, becomes as a factor in study, since freedom from error depends largely upon its existence and exercise. Because much of the information which is obtained from people, whether through their books or their spoken utterances, is based upon incorrect ideas obtained from others, upon faulty experiments, imperfect observations, or false reasoning, and because it is sometimes willful misrepresentation of facts to accomplish some ulterior motive, those who avail themselves of such sources without investigating the truth of the information imparted are frequently led into error. Ordinary gossip and unprincipled newspapers which are published for political purposes are extreme instances of unreliable sources of information. But even books which are written thoughtfully, with every intention of being accurate, contain statements which are biased or untrue. The path of learning is strewn with discarded ideas, theories, hypotheses, which fuller knowledge has shown to be false. The attitude of scientific doubt which opposes blind acceptance of information makes for ad-

vance in true knowledge. It should be cultivated so as to counteract the tendency of people in general, especially of young people and of others inexperienced in proving hypotheses and in working out carefully the solution of problems, to accept without question the statements found in books, papers, and magazines, even though they may have learned to exercise some discrimination in regard to what they hear. There are reasons for this attitude of receptivity, but they are not sufficient to warrant the continuance of unquestioning belief, since that frequently leads to inaccurate solutions of problems, and distorted views of facts.

Our judgment as to the validity of data offered by any author is influenced, or should be influenced, by his sources of information. In scientific studies, direct observation and experimentation are valued as insuring accuracy. In historical subjects, the use of written evidence, or original sources, is a basis for acceptance of statements. In either case, if the author has gained his information through hearsay, there is greater doubt of his reliability as an authority than if he had employed research to obtain his ideas. It is impossible to test every statement made by the people to whom we go for informa-

tion, and we must therefore either reject all statements which we cannot verify, or place sufficient confidence in the men consulted to accept their presentations. There is a place for the experts in various lines of knowledge; and when men are known to have worked in a scientific spirit within their respective fields of research, that is adequate reason why their results should be accepted as authoritative, for the time being at least. There is no loss of self-respect to the student in such acceptance. As for verifying data, there is still sufficient opportunity for that, since not all people are experts, and not all the problems are yet solved.

The reliability of data can be tested in different ways. It may be necessary to consult the original sources, and the training in this work, spoken of in connection with the collecting of data, serves a valuable purpose in enabling the student to verify evidence when its reliability is in doubt. Close observation is sometimes all that is necessary; or reflection, comparison, and, in some cases, experimentation may at times be employed. We may recall the results of our own experience and use them as a test for the new; or we may compare one man's statements with those of another in whose methods of working

we have confidence, for in weighing evidence it is not so much the men as their methods of working which are to be accepted as authoritative. But, after all is said and done, some doubt is still in place.

6. *The tentative nature of hypotheses and theories*

It is very important in studying to recognize the fact that both hypotheses and theories are tentative in their nature, although they may differ greatly in degree of probability. An hypothesis is a guess. It may be more or less scientific, but it is still a guess. A theory, on the other hand, is an hypothesis which has been carried through the stages of investigation, and perhaps experimentation, and which has been modified or confirmed by the process. It is based upon the study of data, and consequently possesses a greater degree of certainty.

Theories may vary in probability. Where data are lacking, or where there is grave doubt as to their validity, the formation of judgment or theory may be quite suspended for the time being. When evidence is ample in amount and variety and is of such a nature as to warrant it, a very positive, definite theory may be formed. Between these two extremes are theories of varying de-

grees of certainty. Some theories or judgments, therefore, are more tentative in nature than others, but all theories must be looked upon as tentative until verified by experience. When thus verified, they become principles, and serve as positive bases for decisions in future thinking.

Whenever evidence is doubtful, and yet is accepted because of lack of opportunity for proving it, or for any other reason, the conclusions based upon such data should be regarded as hypothetical rather than theoretical, until doubts of the validity of the data can be removed. Sometimes the material used as the basis for judgment is accurate, but it is not sufficient because it does not meet every requirement of the problem. Conclusions based upon incomplete data should also be held to be lacking in positiveness. While such judgments have value in that they furnish temporary explanations, their incompleteness should be recognized, so that the mind of the student may be left open for further progress. Not to recognize them as partial, as tentative, is to become fixed and dogmatic and to close the door to investigation and development. It is equally detrimental to character and learning to accept judgments based upon doubtful or inadequate

evidence as final in their nature and to make no further efforts towards positive theories.

Summary: As a precaution by which the way to accuracy of results should be hedged, scientific doubt, or the consideration of the accuracy and reliability of data, must be valued as a factor in study. The data selected in the process of studying because of some bearing upon the problem must be known to be reliable before there can be assurance of validity in the conclusion. This is true of all data, regardless of their source or the method by which they are obtained. But even most reliable data are still properly subject to doubt. Both hypotheses and theories should be regarded as tentative in their nature, and as such subject to further investigation and proof.

### 7. *Verification, or the application of theory, a factor in study*

Since it was the need of readjustment of some phase of experience which furnished the problem for thought, the verification of the theory formulated must consist in its application to the specific situation which gave rise to the thought-process, or to similar situations. The process of logical study is not completed until the theory has

been expressed in some form so as to test its validity; therefore expression, or the application of theory, must be regarded as an element in study.

Application of theory is the only means by which we can be sure that the tension in experience has been removed and the problem solved. Conclusions which cannot stand this test must, of course, be revised or thrown aside, and those which meet the requirements in a satisfactory manner may be accepted. Furthermore, the application of theory, if repeated, tends towards facility in its use, and makes it more thoroughly a part of the person who thus employs it.

As was stated in an earlier paragraph, the application of theory may be carried out very carefully, close attention being given both to process and results. If repeated frequently enough without too great a lapse of time between the applications, the process reaches the mechanical stage and becomes a habit which requires little or no conscious effort for its execution. The occurrence of any favorable opportunity for its use then calls it into activity unless it is inhibited for some new and special reason.

The testing of theories may take the form of using the conclusions as bases for further think-

ing; it may consist of some act of construction, the execution of some design embodying the ideas worked out in the thinking process; or it may manifest itself in oral or written expression, in some social activity, or in some other way. A person does certain things because of the conclusions reached; or by an act of will he refrains from doing because his thinking has led him to decide that it is best not to act. Both definite choice and intelligent action are based upon the mental product; they test the value of that product, and serve as a corrective for careless or inaccurate thinking.

In general, the more genuine the problem has been to the individual who has been studying, the more vital will be the conclusion reached, and the keener the desire to put the results into practice as soon as possible for the sake of verification. In life outside of school, the opportunity for application is sometimes delayed, but if the judgments are strong and clear, they will survive delay and will even force an occasion for use. In school, conditions can frequently be so arranged that pupils may apply the results of study immediately; but even there delay is sometimes inevitable. This possibility of postponement is a strong argument in favor of making circumstances

as favorable as possible for the formation of clear, vigorous judgments.

Summary: In review of this topic, it may be said that application in some form constitutes the test of theory and is therefore a part of the study process. It is indispensable as a means of verifying, correcting, and fixing conclusions, and of giving facility in their use. Application frequently follows the formulation of theory immediately, though it must sometimes await an opportunity. This possibility of delay increases the necessity of strength and clearness in judgments.

### 8. *The place of memorizing in inductive study*

It is sometimes advisable to remember things in a certain wording or order, and for that reason memorizing forms an important element in study. Whatever conscious memorizing is done to give permanence to thought, naturally follows the completion, or at least the partial completion of the thinking process involved in the working out of a situation. The very act of establishing relationships of meaning among ideas tends to make the ideas thus associated easy of recall, so that by the time a certain problem has been thought through carefully, the ideas involved are already partially memorized in their proper order. Think-

ing the steps over repeatedly, reviewing the relations already established, completes the memorizing process. Thus memorizing is seen to be a very thoughtful procedure. Its misuse arises in the attempt to substitute it for thought instead of basing it upon thought, and in making it the sole, or at least the main factor in study.

All memorizing takes place through the forming of associations of some kind. These associations may be of a very mechanical and arbitrary nature, as when we learn words in columns, or commit sentences to memory with no idea of their meaning. Such associations are not the result of thought. Mechanical or arbitrary memorizing has its place in school work, since words must be spelled, the principal parts of verbs learned, and other matter of similar nature so fixed that it may be recalled readily when needed. This memorizing involves concentration of attention, the perception of the correct order, and then repetition to fix the idea in the perceived order.

The memorizing which is a factor in the higher form of studying is based upon associations of meaning among the ideas involved in the study. In this case committing to memory is based upon analysis. Similar or contrasting ideas are associated, as are also groups of ideas relating to some

one subject; also ideas bearing the relation of cause and effect, and ideas in a logical series. Thus, if a history lesson is to be memorized, it is better to memorize the important facts or topics which have been thought out and associated than it is to learn to recite the words glibly without having had any glimpse into the significance of the ideas expressed. In learning a poem, memorizing is usually well advanced when the thought of the poem has been mastered. In geography the causal relations, and in mathematics the logical order, may form the basis of the memorizing process.

There is a double clue to the recall of matter thus associated. One may recall a mere fact, as, for example, that there is much rainfall in Ireland; or, one may have forgotten what the climate is, but may be able to repeat the reasoning process which resulted in the statement about the amount of rainfall in Ireland, and so may again arrive at the fact. Some people, having reached a conclusion, may remember it absolutely; while it may always be necessary for others to recall the reasoning process in order to recall the conclusion reached. We find thus three kinds of memorizing: first, the memorizing of a purely arbitrary order; second, the memorizing of conclusions or statements based

upon reasoning; and third, the memorizing of the chain of reasoning rather than of the results of the reasoning, so that in recalling, the reasoning process must always be repeated in order to bring to mind the statements the recall of which is desired.

Summary: In general, it may be said that while mechanical memorizing has a certain place in school work, it should be limited to its own legitimate sphere. Thoughtful memorizing is of a higher type and should be employed much more extensively than it now is. It is accomplished by placing emphasis upon associations of meaning rather than upon associations of place. When employed consciously it follows the other steps in proper study.

### 9. *The preservation of self in and through study*

The studying which has been described in the preceding pages affords an opportunity for self-preservation and self-development which mechanical study can never yield. While preservation and development of the individuality are not a separate factor in study, they should be present in study and should be advanced to some extent, at least, through its agency.

Human beings vary greatly in native endow-

ment. This variation manifests itself in differences of interests, of capacities for working, and in ways of working. Any method of study which disregards individuals, disregards also these fundamental differences. It subordinates the human being to the subject-matter, and aims for the acquisition of facts rather than for the assimilation of knowledge. In proper study, the individuality of the student has a chance to assert itself. One may respect his own ideas if he has tested them and has found that they satisfy the requirements. He need not yield ready acceptance to all that he hears or reads or thinks, but may reject what is false or irrelevant. He need not lose his identity or his respect for himself even though he does accept the ideas of others, provided the acceptance follows judgment of value. He need be no one's tool or blind follower, but may learn to esteem ideas because of their worth rather than because of their source. He needs to learn the distinction between beliefs and convictions, but having the latter, he may have courage in the face of any amount of opposition. To be alone in one's views is not necessarily to be in error, while to fall in with popular views is to place one's self very frequently in the wrong. Even though a number of people should start to solve the same problem and should employ

in general the factors of study here presented, their procedure would vary from stage to stage because of differences which would manifest themselves at every step.

A very important element in the development and preservation of self is the exercise of initiative; the higher form of study affords excellent opportunities for the manifestation of this activity. The recognition of a problem, the selection and discrimination of data, the organization of ideas, the deferring of judgment, the formulation of theory or hypothesis, the consideration of the truth or falsity of statements, and the final testing of theory involve its use. The highest ideals formulated by educational theory include the right training of whatever initiative man has been endowed with; hence so excellent an opportunity for its proper use as is furnished by logical study should not be neglected.

Summary: In studying, it is an important consideration to preserve and develop one's personality, to exercise initiative, and not to subordinate one's own ideas to those of others without due consideration; otherwise one becomes a mental nonentity; a "passive recipient," and the whole process of study loses its value as a means of training and as a means of arriving at truth.

*General Summary*

The points made thus far in this chapter are, in brief, as follows: (1) A second factor in study is the gathering of data bearing upon the problem. This material may be gathered from many sources, but only that which bears a relation to the problem should be accepted. (2) The organization of material into groups of related ideas is a third factor of study. It tends to take place naturally, but should be carried on consciously with close attention given to the relationships established. As the result of the second and third steps we are able to formulate a theory which is intended to satisfy the problem. (3) A fourth factor in study is the exercise of scientific doubt, or judging as to the soundness of statements. Whenever significant facts bearing upon the problem are presented to consciousness, their validity should be determined in order that the theory based upon such evidence may have value. All hypotheses and theories must be considered as tentative judgments until verified by experience. The value of such judgments is that application or further investigation is encouraged, and the tendency to form positive judgments upon a slight or faulty basis is discouraged. (4) In order

to verify the conclusions reached in the process of logical thinking, a fifth factor in study is needed. This is application, or the execution of theory. Through the use of this factor of study theories are rejected, corrected, or accepted according as they meet the conditions of the original problem which gave rise to the thought situation, or of similar problems. Through use, also, the theory is fixed as an element of knowledge and the expression becomes habitual. (5) To fix knowledge in a certain form memorizing is necessary, and this process, accordingly, makes a sixth factor in study. Thoughtful memorizing is accomplished in part during the course of the thinking process. It is completed by consciously attending to the relationships to be fixed in mind and by reviewing them in their logical order. (6) Throughout the process of inductive study, there is opportunity for the preservation and development of the individuality of the student. This is as it should be, since training in process is fully as much needed in life as the accumulation of facts, though the facts are not to be despised. Inductive study calls for individual effort and individual judgment and affords opportunity for the exercise of initiative. Training in its use is training in the use of native power and

ability to the best advantage. Like results need not be expected, therefore, in all cases, since minds differ in native endowment, in the nature of the store of knowledge already acquired, in the ways of judging data, and in the modes of making application.

# THE NATURE OF DEDUCTIVE STUDY

# III

# THE NATURE OF DEDUCTIVE STUDY

### 1. *Necessity of understanding the problem*

In the deductive process of studying there is the same need of recognition and analysis of the problem as in the inductive study. Without a clear understanding of the situation, there is no criterion for the selection of the theory or principle which is to furnish the solution, since its relevancy is not apparent until the problem has been made plain.

### 2. *Deductive study which begins with the data*

In making use of theories, principles, laws, definitions, or other forms of general knowledge already existing in the minds of the students, two kinds of problems arise. In one kind, the facts, or data, are present and call, not for the formulation of a new theory, but for the use of one which is known. Examples of this form of thinking are seen in recognition, interpretation, iden-

tification, and in other uses of general knowledge. Effort in such cases is directed towards identifying the facts or data present in consciousness with some group of facts for which a satisfactory theory already exists. Through this identification we read into the fact the significance or meaning of the principle which is applied to it. The mathematician who sees that the facts given in his problem involve a certain principle or rule; the scientist who identifies some plant or animal as belonging to some group he already knows; and the pupil who recognizes some part of speech as a noun and consequently attributes to it the properties of nouns, — all these are employing principles, theories, or classifications which they have found already existing in consciousness as the result of previous thinking.

A very frequent opportunity for deductive study of the kind just named is found in the diagnosis of diseases. The physician is sometimes confronted with symptoms which are so pronounced and so characteristic that he recognizes them at once as indicating a certain disease. At other times, the symptoms are more obscure, or exhibit some peculiarity, so that the physician must delay judgment until he has been able to obtain more data by watching the development of

the symptoms. The chemist is constantly employing this deductive process in his analysis of compounds. He makes his examination to ascertain the reactions manifested by a certain specimen, and then classifies it according to the facts he has been able to discover, because, according to the science of chemistry, the reactions manifested by the specimens he has tested are characteristic of certain substances already known and named, and the specimen, therefore, must belong to this class.

### 3. *Deductive study which begins with general knowledge*

In the process of study just described, the thought may be said to move backward from the specific facts to the principle or general truth underlying them. In the second form of deductive study, the movement is from the principle to the data. It is because of a knowledge of general truths that one is able to prophesy, to calculate and foretell results of activities which have not yet occurred. The architect who plans a house or the engineer who plans a bridge must keep many laws in mind as he determines the particulars of his structure. The amount of pressure exerted, the materials which will best resist it,

the most advantageous arrangement of this material, — all these and many other details are based upon rules or laws which must be observed if the results are to be satisfactory. We sometimes hear of attempts being made to forecast the political career of the United States, the predictions being based upon conclusions drawn from the study of nations which have gone through the various stages of development and decline. For example, we are told that a prolonged period of national prosperity results in moral decline, and that the moral decline is followed by political decay. When business is highly prosperous, certain social conditions are pointed out as evidences of a decline of the moral tone of the nation, and the warning note is sounded that such conditions are the forerunners of national ruin.

In the study of geography, this form of deductive study may be employed very often. For example, if the conditions governing the production of rice are known, any country may be studied to see if such conditions exist in it, and the conclusion as to whether rice can or cannot be grown there can be based upon such an investigation. Similarly, the conditions favorable to manufacture and commerce may be treated

with reference to any city or country and the proper conclusions drawn as the result of the application of general truths to particular instances.

### 4. *General knowledge prerequisite to deductive study*

When any new subject is taken up by a student, he must in some way gain a knowledge of the general laws or truths belonging to that branch of learning before he can resort to deductive study. He cannot intelligently employ principles which he does not possess, and as we are dealing here with thoughtful study, we shall limit the discussion to the intelligent use of formulated knowledge. In pursuing such a subject as physics, a person cannot apply the law of falling bodies, the law of equality of action and reaction, or the general conclusions in regard to pulleys and levers until in some way he has gained possession of them. Any subject must be treated inductively until a body of principles is acquired for deductive use. Because of this fact, each subject, however ancient it may be, and however long its truths may have been formulated, is new for each individual learner. Its truths are fresh discoveries for him, and in mak-

ing these discoveries he is repeating history. He may be able to arrive at his conclusions without the use of illustrative material or experiments, but he may be greatly aided, and the time required much reduced, by the use of such material or processes.

### 5. *Using generalizations in related fields*

When subjects are carefully related, or when one subject is a form of application of the principles belonging to another, the principles derived in one subject may be carried over into the related one and employed there. Thus the laws of physics are employed in various applied arts, such as the different kinds of engineering, architecture, and hydraulics, and it is not necessary for a student to rediscover them in order to use them. Having learned them in physics, he can employ them wherever necessary. The same is true in regard to applying the general knowledge of chemistry in a subject like domestic science, where the constituents of foods must be known, also the effects of the various food elements. Furthermore, the preparation and preservation of various kinds of foods directly involve the application of the principles of chemistry.

### 6. *The study of typical forms*

This idea of carrying over principles or conclusions from one field to another finds its application in the so-called "type study" of biology, geography, and other subjects. In geography a typical river system, mountain system, agricultural district, commercial or manufacturing city is studied intensively, and the facts which the teacher knows to be characteristic of the various classes represented are emphasized so that the pupils get clear ideas of them. When other mountains, rivers, agricultural areas, or cities are studied, by analogy the pupils apply to them the conclusion which they reached through the intensive study of the type form. .The study of types is an attempt on the part of the instructor to use a shortened form of the inductive-deductive method, and it will prove successful only to the extent to which the pupils are able to grasp and apply the features which are general.

### 7. *The use of analogy in moral training*

Analogy is frequently employed in studying those subjects which have to do with the moral

nature of man. In this field experimentation may be dangerous either physically or morally. The burnt child dreads the fire, but to expose him to the risk of burning in order that he may acquire the dread may be to expose him to too great a danger. One would hardly encourage a pupil to be dishonest in order that the advantages of honesty may be discovered ; or cause him to lie to teach him the evils of untruthfulness. From history, from the surrounding social life, from fiction, and from imagined characters or actions, materials for study can be obtained which will enable pupils to see the truths which they ought to know. It may be possible to obtain data by observation, or they may be brought out in discussion. The inductive process occupies a relatively smaller place in those fields which pertain to the humanities than in the natural sciences. In ethics, in sociology, in religion, there is but little resort to experimentation, and wisely so because of the great risk attending such procedure in these lines, and because both past and present afford abundant materials which can be made the basis of analogy. This form of study is safer and more economical in various ways, and is therefore to be preferred to the experimental method.

### 8. *Doubt as a source of problems*

Doubt in some form gives frequent occasion for the examination of creeds and principles. Every realm of belief, whether ethical, religious, political, or scientific, is assailed by doubt at some time or other, and men are called upon either to defend their own beliefs, or to demonstrate that the doctrines of others are false. The socialist maintains that it would be best for society if government should own and operate the agencies for the production and distribution of commodities. His statement is called into question, and he tries to prove that he is right. He may also assail his opponent's contention that individual ownership is best for society. Thus we have the two sides of doubt, — proving the truth of statements and proving their falsity. Many a man, when called upon for proofs, discovers that what he has been holding as true has been accepted upon the authority of others, and has not been the result of his own thinking and observation. In other words, he has cherished a belief rather than a conviction. A challenge in the form of doubt brings investigation, and may result in the confirmation of the belief or in its rejection or amendment.

The student must see his problem, in which-

ever form it comes, and must see what is required of him, whether it be the application or testing of a principle already at hand, or the discovery of the theory which will furnish the proper solution. Intelligent procedure depends upon the analysis and definition of the problem, hence the necessity of these.

### 9. *The need of collecting data*

In whatever form the problem requiring deductive study may present itself, it will usually, if not always, require the collecting of data. In case a concrete situation is given, and the principle which will explain it is sought, it frequently occurs that much more needs to be known about the situation than appears at first, before a right solution can be found. When a man is brought to trial for having taken the life of some fellow man, it is not enough for the members of the jury to know merely the fact that he has caused the death of some person. They must know many details of the circumstances attending the commission of the act before they can determine fairly the degree of the prisoner's guilt, or, indeed, whether he is guilty of murder at all. The deed may have been entirely accidental; or the man who is on trial before the jury may have acted in self-de-

fense when he committed the act; or his deed may have been deliberate and willful murder, with no extenuating circumstances. It would not be safe to classify the act and determine the punishment without having learned enough about the case to decide intelligently. This investigation means gathering and weighing evidence or data.

The need of collecting data is still more evident when the studying process begins with rules, laws, or principles, or some other form of generalized knowledge, and seeks to discover their application. The scientist who, knowing the conditions necessary for the culture of the date palm, wishes to find out if it will thrive in the United States, must try to find a place where the necessary favoring conditions are all present, and where no harmful element is found to offset their influence. The final proof of the correctness of his reasoning is the actual growth of date palms in the region selected. If the scientist has taken into his account all of the necessary factors, he will select a favorable place and his plants will thrive; but if he has overlooked some important element, as plenty of moisture for the roots, he may plant his trees where there is an insufficient water supply, and his venture will fail.

In the matter of doubt, when one's own beliefs

are assailed, or when one attacks the beliefs or statements of another, there is much searching for data which shall serve to confirm one's own view or to confound that of the opponent. Evidence is much sought after in all such cases where one does not rest upon mere dogmatic assertion of authority, as did the learned doctors, who, instead of experimenting to discover if oil will freeze, sought to find out by referring to the writings of Aristotle.

### 10. *The sources of data*

The same means of collecting data may be employed in deductive study as in inductive, and it is therefore not necessary to enlarge upon them here, as they have already been explained. Briefly stated, they are observation, experimentation, memory, imagination, reading, and consultation with others. All of these may be resorted to in solving problems by the process of deductive study. It will frequently be necessary to collect data, but the sources employed will vary with the nature of the problem involved. Unless one knows the problem and is familiar with the sources of materials available for the students who are attempting to solve it, it is difficult to lay down specific directions for particular cases. Some-

times experimentation must be employed to demonstrate some principle; sometimes books must be searched for principles, or for facts illustrating them; sometimes the information desired is best gained from classmates, teachers, or people outside of school. The nature of the problem will control largely or entirely the method of collecting data, and as problems vary, so also will the sources employed vary.

### 11. *The organization of ideas a factor in deductive study*

Grouping together ideas which relate to one part of a subject or topic, and then arranging such groups in the order of dependence, whether logical or psychological, gives clearness to the whole subject, and is a great convenience in working with ideas, and in memorizing matter. The lawyer or debater frequently arranges his arguments in the way first described. He first makes his general statement, and then his various points in explaining and sustaining it. He is thus enabled to give an orderly presentation of his material, and in such a way that the audience may get the proposition and the main points in the argument. Sermons are often arranged according to this same plan. The minister announces

a text which is a statement in general terms, and then takes up the argument and application under several heads. A careful listener can get these main points, and from them can afterward retrace the course of the lecture, argument, or sermon.

Similar organization is sometimes possible and helpful in deductive study, which makes use of investigation, experimentation, reading, or other sources. A problem may be so simple as not to require it, but there are times when it is necessary and helpful, and therefore pupils should have practice in using it.

12. *Judging the soundness of statements or the adequacy of a theory a necessary factor in deductive study*

In deductive as in inductive study there is occasion for the examination of data to determine their accuracy. Whenever statements are employed as a means of arriving at a conclusion, or of demonstrating one already reached, there is occasion for judging their soundness. One will not always doubt the truth of the evidence submitted, yet there are times when doubt should be present, and when statements should be carefully sifted to determine their reliability.

In deductive study, the theory, also, must undergo criticism, as we must judge of its applicability, its adequacy to the solution of the problem. A theory or principle may be relevant but not adequate, and it is therefore necessary to discriminate between that which is sufficient to furnish the desired solution and that which is not.

### 13. *Suspension of judgment an element in deductive study*

Sometimes a final judgment as to the theory or principle must be deferred, either because the problem itself has not been completely analyzed, or because no adequate theory has been formulated, or because we are not able to find the right theory. We must then either accept a judgment or classification tentatively, or we must try to remove the difficulty which has prevented the definite acceptance of a solution as adequate and final. This may be done by further study of the conditions of the problem itself, by an inductive study of the theory, or by further search for a theory which has already been formulated.

### 14. *The testing of theory in deductive study*

The test by which the adequacy of a theory is determined is its application to the situation which

caused the search for the theory. As long as theories are never applied to problems, it matters little which ones are selected; but little progress is made by this plan. The more genuine and vital the problem, the greater the need of the application of whatever theory is selected after careful examination. Thus the chemist or physician who attempts to produce a serum for tetanus or rabies, proceeds upon certain principles believed to have been established through the discovery of other serums. Having obtained the serums according to principle, he usually applies them first to some animals to test their efficacy. The bridge-builder or the boat-builder who seeks to meet a new or peculiar situation, not only searches for his theory or principle, but frequently tests it in the manufacture of a model before using it in the actual situation. The final test, however, is its use in the connection for which it was intended.

### 15. *Memorizing in connection with deductive study*

Memorizing based upon thought-associations, or associations of meanings, is present in deductive study also. It may not always be as prominent or as necessary as in inductive study, since frequently the results of previous memorizing are

employed and thus the process is tested. In the new work, the relation of the data giving rise to the problem to the theory which solves it may call for memorizing to fix the relation for future use. Teachers often neglect this part of the school work. The pupils learn to reason out situations in arithmetic or geography, and often let the matter rest there. There are many results which should be kept permanently, and therefore the associations should be made strong enough to endure. After all the reasoning, there must be a residuum of things known exactly and permanently. Memorizing, then, cannot safely be omitted.

### 16. *Self-expression and self-development through deductive study*

Whenever there is a genuine problem present which is felt as such by the student, and whenever the factors of logical study are employed freely by him, there is opportunity for the expression and development of self. It requires initiative in deductive study as well as in inductive to discover the problem, see its implications and conditions, and find and test the solution. Where, however, the process is purely formal, and is carried on under the direction and dictation of another, the

higher thinking powers of the student remain inactive, and consequently undeveloped. Such formal use of theory is seen in the application of rules, principles, or definitions in mathematics, grammar, or physics, when the pupils have little idea of the meaning of the problems and possibly none at all of the rules, definitions, and principles.

Carefully conducted experiments have shown that pupils in the elementary schools are capable of using all of the factors of logical study. Observations have shown that they are given little opportunity to use them. The teacher is the most active element in the schoolroom, and she usually controls much or all of the work. She herself knows very little about thoughtful study, and consequently she cannot give much intelligent training in its use. The result of such a situation is that the child is controlled instead of being trained and directed. He depends upon the teacher to a large extent and is afraid to exercise initiative for fear of consequences; or else he avoids it because it involves too much energy, or because he distrusts his own efforts. Any one who is a frequent visitor in the schoolroom will testify that the pupils either are given little opportunity to exercise initiative, or else that there is a lack of training in its use. Like other activities, it needs

training, and thoughtful study affords an excellent opportunity for such training.

### *General Summary*

In conclusion we may say that the factors present in inductive study are present in deductive study also, though they may be modified to suit the changed purpose of the study, which is to apply principles rather than to formulate theory.

# THE RELATION OF RATIONAL STUDY TO TEXT-BOOK STUDY

# IV

# THE RELATION OF RATIONAL STUDY TO TEXT-BOOK STUDY

In the preceding chapters, the steps or factors in logical study, both inductive and deductive, have been described and illustrated. The discussion has been general in its nature, as it was thought best to show the broad significance of study before confining the attention to the form it takes under certain limitations.

Schoolroom conditions and traditional procedure are the limitations which hedge in the pupils in the years devoted to so-called study. In the ordinary schoolroom we find a group of pupils of nearly the same age, pursuing the same subjects from the same books, and with freedom of physical activity at least greatly restricted. The question is pertinent here as to whether the factors present in purely logical study are possible in the study of the text-book. Some reflection upon the nature of text-book work shows that to a large extent these factors may be employed, though in a modified form.

### 1. *Consciousness of the author's problem or purpose the first factor in text-book study*

First of all, in systematic text-book study as in other study, there is the necessity of some problem. In ordinary experience aside from books, the problem is found in some life-situation, but in the book the author provides it, and the student must find and appropriate it. An author may have written a chapter of psychology to show the nature, kinds, and uses of interest; of geography to show how the mountains of Europe affect the climate and drainage of that continent; or of history to show how New England came to be settled by the Puritans. The problem was present in the author's mind and was worked out by him in some section of his book. The student must rediscover it, and appropriate it as his own in order that he may benefit by his study. His questions to himself must be: "What was the author's purpose in writing this?" "What is the main thought of this section?" "What underlying idea runs all through this chapter, connecting the various parts?" "What important question is answered in this paragraph or chapter?" "What would be a good heading for this paragraph?" Through some such self-ques-

tioning and self-directing of thought, the author's purpose or problem is revealed, whether in geography, history, grammar, arithmetic, or some other subject.

It will frequently be the case that the teacher will bring the class to a consciousness of the problem during the lesson assignment; it may be with the help of the book, it may be without the book. Then with curiosity whetted, the class studies the book for further information in regard to the problem and its solution. As pupils grow older and more capable of independent work, they should assume more independence in finding the problem from the text itself. Less presentation by the teacher should be necessary.

### 2. *Gathering data a factor in text-book study*

When the author's aim has been grasped, the gathering of data is necessary in text-book study, just as it is in any situation where there is a problem to solve. The author supplies much of the material that is to be used when a text is studied, and the student must look upon the book as data presented with the idea of solving the author's problem. The student is not limited to the author's text, however, but may draw upon his own experience and upon his imagination. He may

read books, papers, and magazines, and may talk with people who are informed in regard to the subject he is studying. He may perform experiments and make observations. In any or all of these ways he may supplement the author's text and add largely to the material bearing upon his problem. The criterion for acceptance here, as in other study, is the relevancy of the facts to the problem. That which is irrelevant should be rejected, and only the relevant accepted. If, for example, the problem is, "How the mineral products of the Western states have influenced the development of those states," then students engaged upon such a problem may neglect all the statements made by the author which do not bear upon it, but they must sift out and accept that which contributes to its solution.

It may be urged by some that this gathering of data will consume more time than the class has at its disposal. However, rejecting irrelevant matter saves time; and the examining of other sources than the book can be divided among the members of the class so that the labor is divided. The interest arising from the presence of a problem will also quicken the efforts of the pupils and so save time.

3. *The organization of ideas in text-book study*

The process of organizing ideas differs in text-book study from the organizing that is done when the student must seek and accept data which have not already been organized. Text-books present a certain form of organization, and the student must discover it in order to see fully the author's treatment of his problem. This includes finding the main points in the chapter or paragraph involved in the problem, and in grouping the related minor points about these main points. This organization of the text may be extended or otherwise changed by the use of supplementary material which the student has gathered and accepted as bearing upon the author's problem. An example of organization of text-book material is the following: Examination of a section in a text-book in United States history shows the author's problem to be the explanation of how slavery was introduced into the United States. Further study shows a number of details which group themselves into a few points: —

How slavery was introduced into the United States.
1. Reasons for its introduction.
2. The introduction of negroes as slaves.

*a.* Time.
*b.* Place.
*c.* Agency.

3. The introduction of indentured servants.
*a.* Reason for practice.
*b.* Character of these servants.
*c.* The end of white slavery in America.

Such organization not only shows the author's mode of treatment of his subject, but it also enables the student to handle his material more conveniently. It brings out the main points clearly, and about these can be grouped the needed details. The irrelevant and the unimportant are weeded out. As a result of organization, the author's theory as to the solution of his problem should have been grasped by the person who is studying. The act of making such an outline involves a partial memorizing. The teacher will probably find that it does not require as long a time to memorize such an outline as it does to try to learn the words of the text verbatim in the old way, and the value of the result is greater.

### 4. *The necessity of deferred judgment in the study of books*

The same caution which is necessary in logical study in general, in regard to accepting hy-

potheses and theories as provisional rather than final conclusions, is necessary also in the study of books. The same conservatism, also, in forming such theories is necessary. Forming hasty judgments and jumping at conclusions are of frequent enough occurrence in dealing with literature, history, and other such subjects, to show the need of greater discretion in this direction. It frequently happens that judgments of persons, or actions, or of events, are formed before the situation has been sufficiently worked out by the author to make the formulation of theory possible. To anticipate the course of history so as to introduce the results of a movement at the place where its beginning is described is not always feasible or advisable, and final judgment of its significance should be deferred until adequate knowledge has been acquired. Any other judgments must be regarded as mere hypotheses, and pupils should learn to regard them as guides and not as proved conclusions. Final judgment of character in literature or history must await the development of events sufficiently to warrant it. The results of some treaties and laws are so far-reaching that immediate judgments as to their value would probably be erroneous. Geography, also, frequently calls for the use of cau-

tion in drawing conclusions. To judge of climate on the grounds of latitude alone, and to think that because the people of the Western states are far removed from the Atlantic seaboard, they are therefore uncultured and live in a primitive way, are manifestly rash acts of judgment, yet such judgments are not uncommon. Further data would doubtless cause the correction of one hypothesis and the abandonment of the other.

If children are permitted to do so, they frequently ask their teachers for reasons and explanations, showing that they are aware of lack of fullness in their books and that they desire further data. Here again it happens that the forming of a positive theory must await the right opportunity for the acquisition of knowledge. In the end, the ideas gathered may not be sufficient to warrant the formulation of theory, and if any judgment is formed it must be an hypothesis. But the elements of tentativeness in both hypotheses and theories must not be lost sight of. The need of final verification must always be kept in mind.

5. *The consideration of the soundness of statements a factor in the study of a book*

The attitude of scientific doubt which manifests itself in the consideration of the soundness of statements and the validity of data of any kind is quite as essential a factor in text-book study as in any other. If it was necessary to scrutinize statements with a critical eye when the text-book was but one of several sources from which facts were sought, it is the more necessary to exercise care when the book becomes the main source of data bearing upon the problem. Histories, grammars, geographies, and other texts have been known to contain inaccurate material, and even the truth is at times so startling as to cause a challenge in the mind of the readers. For example, a certain text in grammar gives the following definition of a phrase: "A phrase is any combination of words that does not include both subject and predicate."[1] Then any group of words selected at random might form a phrase, if only no subject and predicate are included. This second definition makes the weakness of the first one more clear: "A phrase is a group of related words without subject and predicate,

[1] Welsh, *Lessons in English*, p. 34.

and having the use of a single word."[1] The following statement in regard to the Russian peasants is taken from a geography text-book published before the recent Russo-Japanese War and still in use: "It was not until 1863 that serfdom was abolished. Hence it is no wonder that the masses are without education; but great progress is now being made."[2] A certain text-book in United States history, in treating of the opening events of the Civil War, says: "But the attack on Fort Sumter changed the whole situation. Doubt was at an end on both sides. Virginia, North Carolina, Tennessee, and Arkansas, forced now to take one side or the other, soon joined the Confederacy."[3] The question might well be asked, "What was the situation in the Border states where both sides were represented? Was all doubt ended there by the attack on Fort Sumter?" Furthermore, the statements, "We are to remember that, though the war was caused by slavery, it was not at first about slavery, but about secession,"[4] and "The Southerners were naturally more military than the Northern

[1] Webster, *Elements of English Grammar*, p. 39.
[2] *The Werner Grammar School Geography*, Part i, p. 244.
[3] Eggleston, *Household History of the United States*, p. 310.
[4] Eggleston, *Household History of the United States*, p. 311.

people,"[1] are somewhat startling to the pupils who have been taught up to this time that slavery was the cause of the war and have heard little or nothing of secession, and who have believed the Northern soldiers to have been in every way equal to the soldiers of the South. Such statements should challenge pupils to question and investigate their worth. The author's accounts or explanations may be compared with one's own experience. His use of sources and his method of treating problems need to be considered to determine whether he works cautiously or is hasty in his judgments. It is often worth while to ask the questions, "What is the writer's authority for the statements he makes?" "Does he base his conclusions upon observations, upon written evidence, or is he relying upon hearsay?" These questions are frequently in order in the study of history, geography, and the natural sciences. Other books and sources of information may be consulted as a means of verification or correction. Caution is especially necessary if magazine articles and newspapers are used as texts in studying certain subjects or phases of subjects.

It is not intended that pupils shall question

[1] Eggleston, *Household History of the United States*, p. 312.

everything they read or hear. Usually they will not need to have doubts as to the reliability of the statements made. But the attitude of ready acceptance of everything needs to be replaced by the attitude of mind which questions that which seems out of harmony with previous experience, which is startling in its nature, which seems to lack sufficient evidence, or which seems too general in its scope. Such instances, and possibly others, furnish occasion for thought and investigation as to the validity of the material offered. In this respect, text-book study does not differ from any other study in which data are presented to throw light upon some situation. Judgment as to the soundness of statements is usually necessary, though due credence should be given to the results of the labors of experts in the several fields of knowledge.

### 6. *The need of verification or the application of theory in the study of the text-book*

The use of verification as a factor in studying books is frequently modified by the fact that the author makes his own application of the theory he has advanced. But because the books are text-books they are limited as to the amount of space that can be devoted to any part of a subject;

consequently, the space which is given to verifying theories is usually small, and the amount and variety of material presented for giving facility in their application are often inadequate. There is much that can and should be done to apply the theories, presented in the books and rediscovered by the pupils, to life-situations in which pupils participate. Real occasions for the use of arithmetical ideas and correct grammatical constructions are possible, and lend a vitality to the principles presented in the text-book as the examples given by the author of the book cannot. All of the forms of expression described under this topic in the consideration of logical study are applicable in text-book study, whether it be oral or written expression, constructive work, social activity, some application to the affairs of ordinary life, or even the use of the theory as the basis for further thought. To test the matter, let the reader who has followed the discussion of proper study to this point read *Silas Marner*, some play of Shakespeare, a chapter in some history or other book which contains thought material, and make use of the various steps of study in his reading. Let him note the effects of such effort upon his idea of the right way to study. After such a test, he will be better able to state whether

he considers the plan feasible and whether the results are worth the effort. One need only recognize the value of application as a factor in higher study and look for opportunities for employing it, and frequently some appropriate form will be found. As was said in a previous chapter, the time for using the theory may be delayed until a favorable opportunity arrives, but often the verification may be made as soon as the theory is clearly understood. Strength and clearness of the ideas are very necessary in order that these may function when there is an opportunity for them to do so. It must not be overlooked that strong feeling associated with an idea aids its recall and adds to its effectiveness when recalled. A purely intellectual idea of a lie is not hard to gain, but if the lie can be shown to be stupid, cowardly, and harmful, there is a greater probability of its being avoided because of the feelings associated with the idea.

### 7. *Memorizing as a factor in study*

With ideas selected and associated through the use of the factors of study already discussed, memorizing of the logical type has been provided for to some extent. Its further use in the study of material selected from text-books does not

differ from the memorizing described under logical study. Its use is both possible and advisable in such a connection. But mechanical memorizing, so commonly employed, is to be avoided. In thoughtful study, either the results of reasoning should be memorized, or the chain of reasoning which led to the results. For example, after having discovered the rule for changing common fractions to decimal fractions, the pupils may memorize the rule, or the steps by which it was developed.

### 8. *Some phases of deductive study of books*

To any one who is at all acquainted with text-books, it must be clear that there is frequent occasion for deductive study in connection with them. The solution of problems in mathematics, parsing and sentential analysis in grammar, the explanation of geographical phenomena, the interpretation of history, the consideration either of form or of thought in literature, the classifications of science, — all involve the calling up of principles, rules, theories, or other general forms of knowledge, and the application of them to concrete instances. There is the same need for discovery of problem, and for analysis of data as in any other study. There is the same need for the

exercise of discrimination in the selection of the rule or principle which is to be applied, or of the class to which the individual is to be assigned. The problems may vary in the number of steps of logical study involved, but some of the steps will be present always, while others may be present at times. There will always be data to be examined, the problem to be recognized, and some form of general knowledge to be applied to the data. It may not always be necessary to collect outside data, to judge of the validity of the statements given, to organize the material, to suspend judgment, or to memorize. The steps involved will vary with the nature of the problem. When the proof of a proposition or the application of a principle or rule is required, facts or data must be collected and examined with reference to their bearing upon the statement which is to be tested. Such examples are found all through geometry: *e. g.* "The sum of the angles of any triangle is equal to two right angles." In a similar way the axioms in mathematics are tested: *e. g.* "Things equal to the same things are equal to each other;" and "If equals be added to equals, the results are equal." Some of the questions found after each chapter in Fiske's "History of the United States" call for the same kind of activity: *e. g.*

"Should all things that ought not to be tolerated be forbidden by law?" "Was it right for the New Englanders to disobey the navigation laws?" "Is general disobedience of law and authority ever justifiable?" "Why have so many people come to America to live, and so few left it to live elsewhere?" In some of the examples given, proof of some general statement is called for. In others, concrete facts are stated, and underlying principles which will explain them are required. In both kinds of problems, generalized knowledge already in possession of the pupils is employed, and hence the study is deductive.

The criticism has been made that this form of logical study has been over-emphasized in school, and that pupils have been expected to apply general ideas which they do not clearly understand. Since both inductive and deductive study are possible in school work, it may be said in general that when pupils are found to lack the general knowledge needed for the solution of problems, the inductive form of study should be employed; but that when the pupils possess the principles needed for explanation or interpretation, the deductive form of study should be used. The two methods may thus be used in the same study period in connection with the same lesson, or they may

not thus occur. It depends upon the nature of the lesson and the mental equipment of the pupils how frequently and closely they are associated.

### 9. *The relation of proper text-book study to initiative and self-development*

Although the use of books does not afford the same opportunity for the use of one's own powers, nor provide the same motives and interests as the study which arises from life-situations, where the problems are felt to be of moment, yet it does furnish a means for self-development and self-expression if it is rightly used. It is for the purpose of furthering this right use that the explanations of this chapter have been given. If one would be helped by the use of books, he must master them and not be mastered by them; that is, he must weigh, judge, and test before he accepts statements, or else he will lose his own individuality. It requires the exercise of initiative to discover the problems in books, just as it does to discover them in logical study aside from books. It requires it, also, to select data, accept, reject, and organize them, and grasp the author's theory. One of the highest expressions of the self will be found in the testing of statements and in the recognition of judgments as tentative because of

faulty or inadequate data. And so, also, in the form of application which the student employs, there is opportunity for the development of personality, provided the student be free to exercise choice as to its form.

If text-book study be limited to rote learning or to deductive study, the opportunities for the exercise of initiative and self-expression are greatly limited. Since the school's recognized function is to further the wise development of these powers of the pupils, it should not neglect so valuable an agency as the higher form of study offers. If study could be directed in genuine life-situations where problems of real importance to pupils abound, the opportunities for self-expression and development would be most favorable. But text-book study is not devoid of possibilities in this direction and these possibilities should be recognized and utilized.

10. *Are all of the factors employed in all study?*

Before leaving this discussion of the use of systematic study in connection with school work, the question should be considered as to whether all of the factors of higher study are necessary in all study. The answer must be a decided negative. First of all, as was pointed out in the first

chapter, a great deal of school work does not deal with the assimilation of knowledge, but with the mastery of technique ; for example, spelling, mechanical work in arithmetic, and the formal side of reading. There the mechanical side prevails and the readjustment of ideas based upon their thought-relations is not involved. In the second place, much of the subject-matter which does involve the relationship of ideas based upon meaning is of such a nature as to present little of value in the way of problems. It is intended to entertain, or to cultivate taste and sentiment rather than to furnish food for thought. Some school histories, books about nature, and a good deal of the reading matter and literature put before pupils belong to this class. They present few logical problems of value and call for little purposive thinking. Whether they should do so to a greater extent than is now the case is a question worthy of consideration, as is also the question as to whether the logical possibilities, slight though they are, should not be more fully realized. Even in subjects or subject-matter which call for systematic study, there are great differences in the nature and importance of problems presented from time to time. Not all problems are worth the time and effort involved in the use of all the factors of

study; and some problems may not require the use of all these factors in order to be solved satisfactorily. Frequently minor problems present themselves during the study of larger ones. It is sometimes necessary to ignore them entirely or to postpone their consideration until some other time. If their solution is indispensable to the main problem in hand, then time and attention must be given to them as to other problems.

It may be said, further, that some problems may involve several or all of the factors of systematic study and yet be solved quickly, while other problems may require a long time for solution, being taken up for consideration from time to time as circumstances determine. For some reason the gathering of data may be deferred, and meanwhile the problem may rest unsolved; or delay may be due to some other cause. In general it may be said that the length of time spent in studying problems varies. Several may be disposed of in one study period, or one may extend through a long period, being considered from time to time as opportunity offers.

### *General Summary*

The proper study of text-books does not differ from logical study, but is identical with it. In

studying books, the student must discover the author's problem, and must see what data are given which bear upon it. There is the same need of gathering data, and of testing and organizing them that is present when the problem arises from some experience aside from the book. It is clear that books are not always able to offer the final word in the solution of problems, and that the conclusions hazarded by authors cannot always be accepted without verification. In such cases, judgment must be deferred. There is just as much need of testing theories derived from the study of books as there is of testing any other conclusions in order to give certainty and facility. The study of books calls for memorizing, though the memorizing employed should be based upon associations of meaning and not upon mere mechanical relationships. In deductive study, caution must be exercised that pupils understand the principles which they are to apply. Such text-book study as has been here described is highly favorable to the development of the personality, since it calls for the exercise of initiative and of all one's powers, instead of being based solely upon rote memory. It has been shown, also, that while all of the factors of proper study may be employed in the study of a text-book les-

son, it is not always necessary for all of them to be present. The problem may not require it, or the pupils' ability may be such that they can safely omit one or more of the factors.

# DO CHILDREN POSSESS THE ABILITY TO STUDY LOGICALLY?

# V

# DO CHILDREN POSSESS THE ABILITY TO STUDY LOGICALLY?

## 1. *The importance of knowing whether children can study*

HAVING seen the nature of logical study and having followed the application of its various steps to the mastery of a lesson in a book, it is of great importance to know whether children are capable of studying in the manner described. Can children see the author's problem, or find the underlying thought running through a lesson? Can they collect material bearing upon this problem? Can they find the important points in a chapter, or paragraph, or other section, offering a problem? Can they question statements, and see discrepancies in the material presented? Can they, in general, employ the various factors of logical study? If mechanical study is the only kind of which children in the elementary schools

are capable, then the whole discussion of study down to this point is irrelevant so far as they are concerned.

2. *Factors influencing the preparation of the experiments to determine the ability of pupils to study*

The attempt to find an adequate answer to the question in the preceding paragraph involved the consideration of many serious difficulties. The grades, the number of children, the location of the schools, the subjects to be used in testing, the nature of the exercises, and the manner of conducting them, — all these and various other points had to be determined before the tests could be given. The situation was made even more complicated by the desire to train part of the classes in systematic study after the first tests had been given, and then to give all pupils, both trained and untrained, a second series similar to the first, with the purpose of finding out what differences were to be observed in the results obtained from the two classes of pupils.

3. *The subject and classes chosen for the tests*

The subject of geography was chosen for the tests, both because it furnishes abundant oppor-

tunities for proper study, and also because it is a subject which is quite sure to be taught in all of the higher grades of the elementary schools. History is not taught so generally as geography, and for this reason was not selected for the experiments. The ideal procedure would have been to train the pupils in the method of study in connection with all of their school subjects, and to test them in all of these; but while the teacher might have trained them in all branches offering opportunities for logical study, the testing would have been too arduous and too time-consuming, especially since more than a thousand pupils were tested.

The tests were given to pupils of the sixth and seventh grades only. Pupils in these grades are supposed to be able to express themselves sufficiently well in writing to be able to work upon the material given. The eighth grade was not chosen because of the possibility of wishing to give similar tests during the following year, in which case the eighth-grade pupils would not have been available because they would have left the elementary school.

In order to make the results as general as possible, the tests were given to as many classes as could be obtained for the purpose. More than

twelve hundred pupils wrote upon the first series, which was given early in the year 1907. When the second test was given three months later, several classes dropped out, and the number was reduced to about eleven hundred. In each pair of tests, only those results were considered which were obtained from pupils present in both of them. Between the time when the first series of tests was given and the time when the second one was written, part of the classes were trained in the use of the factors of study, while the others were left without any change in their mode of working. The second series of tests, accordingly, made it possible not only to compare each class's record with its former one, but also to compare the results obtained from the trained classes with those obtained from those not trained.

### 4. *The nature of the tests*

The first test in each series was probably the most difficult. It consisted of a short selection from one of the geography text-books and was accompanied by the following requirement: "Here is a lesson from a book such as you use in class. Do whatever you think you ought to do in studying this lesson thoroughly, and then tell (write down) the different things you have done in

studying it. Do not write anything else." It was hoped that the results would show whether any pupils were employing the factors of logical study, and to what extent they were employing them.

In another test, the pupils were given a question with this direction: "Do not answer this question, but write down everything you think you ought to do in finding the answer to it." For the first series in the sixth grade, the question was, "Why is Pittsburg such an important commercial and manufacturing city?" For the second series, it was the following: "Tobacco used to be grown almost entirely in the Southern States, but now it is grown extensively in the Northern States as well. Why has this change come about?" In the first series for the seventh grade the question was, "Why do terrible famines occur in India every few years?" In the second series, the pupils were asked, "If you were a voter and a governor was to be elected in your State, how would you decide which of the candidates to vote for?"

This test, like the first one, instead of making some definite requirement of the pupils, emphasized the subjective side of the problem. In the first test the pupils were to tell what they had done; in this one they were to tell what they would do. The object was the same, that is, to

discover to what extent the pupils were employing the factors of logical study.

The last test in each series called directly for systematic study of a lesson. It consisted of a slip containing subject-matter from a text-book, and an accompanying slip containing the directions and requirements, both slips being given to the pupils at the same time. The pupils were to find the answers to the following questions, numbering them as the questions are numbered: —

1. What is the subject of this lesson?

2. Write a list of the principal topics in it.

3. What do you think is the most important thing in this lesson?

4. What are your reasons for thinking this so important?

5. What other facts do you know about any of these topics?

6. What questions would you ask in regard to anything in this lesson that is not clear to you or that you would like to know more about?

This test was placed at the end of the series, so that it might not serve as a clue in the writing of any of the other exercises.

5. *The ability of pupils to find what a lesson is about*

The results of the tests indicate that while these pupils do not find the subject of the lesson to any great extent when studying without definite directions, they are capable to a considerable extent of finding it when they are required to do so.

6. *The ability of pupils to organize subject-matter*

In judging of the adequacy of a list of principal topics, two questions were kept in mind: Do the topics cover the entire lesson? Do they include the main points only, or are they too detailed? Some pupils gave topics which were very good as far as they went, but they left out some important section of the lesson. For example, in the last test of the second series, a number of children omitted to include a topic which would cover the last paragraph, the paragraph which tells about the homes of the different races, and how the homes of the races are separated from one another. On the other hand, some pupils prepared a topic for nearly every sentence in the lesson. Such lists as these could not be reckoned as adequate because they were either too meagre, or because they were too detailed in nature. How-

ever, even such lists show some degree of ability, and taken into consideration with those considered adequate, they show that these children are able, in varying degrees of efficiency, to analyze a lesson and find the essential facts in it.

### 7. *The ability of pupils to exercise doubt*

On the whole, the pupils accepted the subject-matter placed before them without questioning its accuracy. The tests do not reveal any power the children in these classes may possess of seeing discrepancies between what they read and what they know. Whether they really possess this power and would exercise it if permitted or required to do so is a point left undecided by these exercises.

### 8. *The ability to supplement the text of the lesson*

The evidence in regard to the ability of pupils to supplement the text, that is, to seek data from other sources than the book, is stronger than it is regarding the factors already considered. The supplementing is shown by the fact that the pupils drew upon memory for additional data, used their imaginations to picture scenes, resorted to books and maps, and asked questions relevant to the lesson, but not answered in it. They named,

also, various ways by which they would increase their knowledge of the lesson if they had opportunity; *e. g.*, read books, or question people who know. About thirty per cent of the pupils gave additional facts relevant to the lesson, and about one third asked questions calling for more knowledge about it. Many questions were so indefinite that their real purpose was obscure, but many excellent questions were asked. The evidence is very strong that pupils can collect data from outside sources intelligently and profitably.

9. *The ability to see problems relating to the lesson*

The power of the pupils to sense the author's problem is revealed in a curious way. In writing the first test, a number of pupils began to write a list of the important topics in the lesson, and gradually changed their statements to questions, indicating that they had confused the statements of facts with the questions which called for them. They were feeling the author's questions or problems which had brought about the statements in the text.

In some papers, statements or topics only were given. In others, there were questions only; but a good many were of the mixed type shown above.

The questions asked in the first and last tests

of each series indicate strongly that pupils can feel the author's problem, and can see problems growing out of the lesson presented, that is, supplementary problems.

10. *The ability to group related ideas*

The tests showed almost nothing about the power pupils may have to organize subject-matter. However, a series of experiments conducted by the writer with a fourth-grade class, and observations of other classes, show conclusively that pupils can be trained to see the large points in a lesson, and to group the related ideas about these large centres.

11. *The formulation of hypotheses by pupils*

An unexpected result of the tests was the manifestation of the ability of the pupils to form hypotheses as a basis for solving the problem presented to them. More than a score of children in each of the two grades volunteered explanations which were quite relevant. This was especially noticeable in the sixth-grade test about tobacco growing in the North, and in the seventh-grade test about famines in India.

Some of the explanations given by the sixth grade are as follows: 1. Change in climate

either in the South or in the North. 2. South needs land for cotton. 3. Better facilities for manufacture and transportation in the North. 4. Cheaper to grow tobacco in the North than to have it shipped from the South. 5. Increased demand for tobacco. 6. Changes in economic conditions in the South due to the Civil War. 7. People of the North have learned how to cultivate tobacco. 8. Possibly a better quality can be grown in the North than in the South.

In regard to the frequent famines in India, the seventh-grade pupils hazarded the hypotheses that they might be due to climatic conditions, to the nature of the surface, to poor soil, to unfavorable winds, to inability to obtain sufficient water for irrigation, to occasional floods, to some insect which destroyed the crops, to oppressive government like that of Turkey, to density of population, to lack of knowledge of farming, to indolence, to lack of foresight or thrift, or to lack of adequate means for transportation and communication.

Not all the theories advanced were as relevant or sensible as those just given; but the fact that so many were given is indicative of the ability of children in these grades to form hypotheses which are worth considering as possible explanations of the problems demanding solution.

*General Summary*

On the whole, the different kinds of tests in geography given pupils in the sixth and seventh grades show that these pupils can employ the various factors of higher or logical study to a considerable extent. They were evidently not conscious of the steps in systematic study; yet supplementing their account of what they had done or would do in study by the results produced when they were called upon to employ the various factors, a sufficiently large number gave evidence of their use to warrant the conclusion that these pupils can find the subject or leading thought of a lesson; they can organize the material presented; they can supplement the textbook intelligently; they can ask intelligent questions involving valuable problems; and they can to some extent formulate sensible hypotheses for the solution of problems. The ability to work in characteristic ways is shown by the sources employed for information, by the theories advanced, by the questions asked, and, to a lesser degree, in various other ways.

# ARE CHILDREN TAUGHT TO STUDY LOGICALLY?

# VI

# ARE CHILDREN TAUGHT TO STUDY LOGICALLY?

## 1. *The waste of effort shown by the tests*

In the preceding chapter it was shown that a sufficiently large number of pupils in the grades tested employed the steps of logical study to warrant the conclusion that it is within the power of pupils of at least the fifth and sixth grades to make use of them. Aside, however, from the indefiniteness of the language employed, which often quite concealed the pupils' meaning, the tests reveal the fact that there is great waste in studying. In the first test of the first series, fourteen per cent described their procedure in studying in indefinite terms, saying they would "think," "study," "try to understand." About thirty-eight per cent of the pupils thought the thing to do was to write a more or less literal version of the text, and about twenty-nine per cent memorized the text to some extent. Nearly one fifth of the whole number showed, either by doing nothing at all or

doing something not required, that they did not know what to do. These figures show that a good deal of effort was undirected, and that much was misdirected. The pupils wavered between indefiniteness and mechanical study. They did not clearly know the right things to do, and there was a great scattering of effort in various fruitless kinds of work.

The second test in the series shows a very high per cent of those whose ideas were so indefinitely expressed that the meaning could not be determined. It shows, also, great expenditure of effort in unnecessary ways. While about one third of the pupils showed by their answers that they could take adequate measures to solve the problem given, thus indicating that it is possible for pupils of the age of these to do such work, the question is, What about the two thirds whose work was not adequate? Some solutions were distinctly inadequate, from about one fourth to one third, and the rest of the papers were so indefinite that no judgment could be formed as to their worth in this particular.

The third test reveals a still greater degree of inefficiency than either of the other two. In the last test of the first series, more than 73.6 per cent of the pupils failed to find the main thought

in an ordinary geography lesson; in the corresponding test of the second series, more than 86.2 per cent failed to find it. More than two thirds in each of these two tests failed to make an adequate list of the principal topics, though the matter presented was simple enough for some pupils to make excellent lists. The greatest difficulty experienced by the pupils was in connection with the requirements to find the most important thing in the lesson, and to give reasons for thinking it so important. An appreciable per cent chose a minor point in the lesson, and several chose something not in the lesson at all. Many named more than one thing as being the most important thing in the lesson, some even including practically every point of the lesson. Such answers had to be classified as indefinite. Many gave a topic which was so general, so unlimited, that their answers, too, were marked indefinite. The reasoning gave the poorest results in these tests. It was based frequently upon some personal consideration. A thing was considered most important because it was interesting to the writer; because he had never known it before; because he had known it before; because he might need it in his geography lesson; because he might need to talk about it some day. Or, having named several items as

being most important, a pupil would then advance reasons for the importance of one of them.

The lack of clearness in expression and the misdirection of mental activity are shown in the responses to the fifth and sixth requirements of the last test. In response to the question, "What other facts do you know about any of these topics?" more than fifty per cent of the answers in each test were irrelevant, were taken from the text which was being studied, or bore no relation to the requirement.

### 2. *Reasons why the factors of logical study are not employed more generally*

If enough pupils use the various factors of proper study to show that it is possible for children of their age to employ them, the questions arise, Why do not many more of the pupils employ them? Why are they not in common use? In trying to solve this problem, a study was made of the present schoolroom situation by means of visits to some seventy classes, and by a *questionnaire* given to one hundred and sixty-five teachers, with the object of trying to find what their ideas in regard to study are, and what they try to have their pupils do when they teach them to study. As far as could be avoided, no

clue was given to the teachers writing this *questionnaire* which could in any way influence their answers. The aim was to discover the things which stood out prominently enough in consciousness to secure expression when the process of study was being described or illustrated. Had direct questions been asked about the various factors of study, probably many of the teachers would have felt the influence of suggestion in shaping their replies.

The *questionnaire* as a whole reveals that these teachers themselves are lacking the proper conception of the process of higher study; that they tend to exalt memorizing; and that they do not as a class accord recognition to any factor or factors as being essential to study. In several instances, the factors which they have recognized to a considerable extent were employed largely by the pupils in their studies; and the factors which the teachers have overlooked in their reports were used but little by the pupils in their tests.

### 3. *A second means of investigating present procedure in teaching children to study*

With the purpose of investigating still further the extent to which pupils are being taught to

study in the higher sense of the word, seventy recitations were observed in various cities of the United States. During the year 1905–06, a *questionnaire* was sent out to a number of principals of schools. This *questionnaire* was to be filled out by the principals after certain recitations had been observed. While information was desired mainly in regard to how the teacher treated the thought-content of the lesson in the assignment, what he expected the pupils to do with it in preparing the lesson, and how he disposed of it during the recitation period, other items were added, not only to supplement the chief purpose, but also that they might prevent the main points from being so prominent that the report upon them would be more or less biased.

At the time that this *questionnaire* was sent out, the writer was doing some experimental work with a fourth-grade class in reading; consequently, the principals were asked to observe reading classes in the intermediate department, including fourth, fifth, and sixth grades. Reports were received from Duluth, Minn., Madison, Wis., Passaic, N. J., and Baltimore, Md. The writer visited a number of schools, both public and private, in New York City, and several classes in the public schools of Passaic, N. J. The sub-

jects in which recitations were observed were reading, history, arithmetic, geography, and language.

The data obtained were tabulated according to subjects, and while there is much that is valuable in a recitation which is not susceptible of tabulation, for example, the spirit of the teacher and the class-room atmosphere, still it is worth while to note some of the things done or left undone in the way of training pupils to work independently and logically.

### 4. *General summary of the questionnaires, and observations*

Careful examination of the results of the observations and both *questionnaires* compelled the conclusion that, although pupils possess ability to employ the various factors of proper study, the teachers lack a clear conception of what such study is. The teachers who wrote the *questionnaires* do not themselves employ these factors to any great extent; and the teachers observed in the class-rooms are not training their pupils to use them. The teacher is the centre and moving power in nearly all of the work, and the requirements laid upon the pupils involve mechanical effort to a large degree. The aim of the work as

a whole seems to be the mechanical acquisition of subject-matter.

The development of the power to work independently, intelligently, and economically is almost entirely ignored. The teachers do not know of what such study consists and consequently give little thought to its cultivation. They would probably do so if they had definite ideas as to its nature, for they are frequently heard to lament the fact that their pupils do not know how to study or to think. Unfortunately, the books on method give little or nothing in regard to method of study. They deal almost exclusively with the teaching side of the school-room situation, and do not say anything at all about training pupils to study, or else what they do contain is stated in such general terms that it benefits the teacher very little.

# CAN CHILDREN BE TAUGHT TO STUDY LOGICALLY?

# VII

# CAN CHILDREN BE TAUGHT TO STUDY LOGICALLY?

## 1. *The attempt to train pupils in the use of the factors of logical study*

In Chapter V the statement was made that part of the classes tested in both the sixth and seventh grades were trained in the use of the factors of higher study between the first and second series of tests, the idea being to discover what difference such training would produce in the results of the second series. It must be stated frankly that the conditions governing this attempted training were far from ideal. Two of the five classes trained in the sixth grade and three of the four classes trained in the seventh grade were in schools of practice where the pupils were not under the care of one teacher continuously; but were taught by pupil teachers or special teachers part of the time. Under such circumstances, the influence and training of even a strong teacher would not have full opportunity

to produce their effect, and not all of these teachers were strong, either in their mental grasp or their teaching ability. At least two were very weak.

Then, too, with but one exception, not one of the teachers of these classes had attended the lectures in which Professor F. M. McMurry of Columbia University had advanced the theory of systematic study; so that they lacked both the lectures and the accompanying discussions of them by experienced teachers. They were taught the theory of study at second hand by those who had attended this class, and an interval of three months was a short period for them to learn the theory and then apply it to classes with sufficient success to produce marked results.

To add to the difficulty, there was almost no literature on the subject to put into their hands to help them in understanding the theory and its requirements, and there were no schools practicing the theory which could be observed and used as guides. A copy of a paper read by Professor F. M. McMurry before the Department of Superintendence of the National Educational Association in Louisville, Ky., in March, 1906, on the subject, "Some Suggestions for the Improvement of the Study Period," was sent to each teacher

who undertook the training work. In addition, there was sent a copy of the theoretical discussion of the steps in systematic study which was part of an essay on "The Study of the Reading Lesson in the Fourth Grade," prepared by the writer of this book.

Under the compulsion of circumstances the work of training was undertaken even with such adverse conditions, and the courage and good will of the school teachers and school principals who aided in the task are gratefully recognized.

If the training of the pupils was successful, the percentage of pupils in the trained classes who used the factors of logical study in writing the second series ought to be greater than the percentage who used them in the first series; and the number of trained pupils who wrote indefinite, general, or irrelevant answers should be lower in the second series than in the first. An examination of the results shows that the changes are not always in the direction of greater proficiency for the trained classes, though even under adverse conditions they excelled in a number of particulars.

Of the answers which are sufficiently definite to show what the pupils did in studying, those which approach nearest to higher study are in

regard to finding the subject, finding the important points, verifying the statements, and supplementing the lesson.

2. *Summary of the comparisons of the trained and the untrained groups*

The three tests show that on the whole the trained sixth grades made a better record in the second series than the untrained sixth grades. The trained seventh grades excelled the other seventh grades in finding the subject and in selecting the main points of the lesson, both in the first and in the last tests of the series, but their record as a whole was not as strong as that of the trained sixth grades. It is doubtful whether, save in the two particulars mentioned, which are both very important, their record was any better than that of the untrained seventh grades.

3. *An experiment in teaching pupils to study a reading lesson*

Confirmatory evidence of the ability of pupils in the elementary school to study may be seen in the results obtained from a reading class in the fourth grade in the Speyer School, the practice school of Teachers College. A series of sixteen lessons was given by the writer to this class

in the spring of 1906, to determine whether the pupils of the fourth grade possess the ability to employ the factors of logical study, and whether they can be taught to use them independently and habitually. The lesson periods were from twenty-five to thirty minutes long, and there was no study period. The text used for reading was a version of the *Odyssey* edited by Mrs. Lida B. McMurry.

This series of lessons showed plainly that pupils in the fourth grade are capable of finding problems for themselves, of organizing the lesson, of asking intelligent questions, of forming sensible hypotheses, of exercising judgment as to the statements made by the author, of mastering formal difficulties for themselves, and, in various ways, of exercising initiative wisely and profitably. It showed, too, that when pupils work in such a way they work with zeal and accomplish much more than is done when they must spend time upon useless details and mechanical methods of working.

*General summary of the tests and experiments*

The fourth grade was selected for these tests because it is usually the lowest grade in the intermediate department of the elementary schools,

and it was thought that whatever abilities such pupils possess might reasonably be looked for to at least as great a degree in all of the intermediate and grammar grades. The results of this series of lessons, coupled with the results of the tests in geography given to the sixth and seventh grades, indicate strongly that pupils in the elementary schools in grades including the fourth, as well as higher classes, are able, not only to employ the factors of logical study, but also that by means of systematic effort they can be made to improve in their employment of them.

# SUGGESTIONS FOR TRAINING CHILDREN TO STUDY

# VIII

# SUGGESTIONS FOR TRAINING CHILDREN TO STUDY

## 1. *The teacher's attitude toward the subjects to be taught*

TEACHERS have asked whether, under the conditions in which they must do their work, it is possible to train pupils to study thoughtfully. They must prepare their classes to face examinations set by the school authorities, and subject-matter means just so much material which must be learned by the pupils by the quickest possible process in order to cover the field before examination time. As a consequence subjects are not regarded as means by which pupils may be instructed and trained, but as so many things to be disposed of in the shortest time. But suppose we assume that pupils trained to study can not only master the subjects in less time, but can do so with much more profit to themselves, then what should be the teacher's attitude toward the subject-matter of his grade? Clearly the mate-

rial should assume a new importance. Not only may it be mastered against the day of examinations, but it becomes a means of valuable training in ways of working which constitute a real preparation for life. In preparing for class-work, the teacher should not merely study the lesson for his own command of the facts. For the sake of the class he must try to discover the possibilities afforded by the lesson for training the pupils in thoughtful ways of working. Which steps can the pupils employ readily in the case of a given lesson? With which will they need help? Which must they employ? Which may be safely omitted? These questions are a few of the many which will surely suggest themselves to a teacher who undertakes to give his class systematic training in the higher form of studying. Like most new modes of working, it may in the beginning require a great deal of time to determine the possibilities of the material, but practice will bring facility. The teacher will be able to see quickly whether the lesson calls for inductive or deductive study; whether the problem is or is not quite apparent; whether the book offers sufficient data, or whether it must be supplemented; what organization is possible or advisable; whether the lesson contemplated should end

in a positive theory or in a suspended judgment; whether memorizing is necessary; and what forms of verification are profitable and possible.

### 2. *The teacher's attitude toward the class*

Having done as much of this preliminary work as is necessary, the teacher needs to keep his mind open and flexible, so that he shall not dominate absolutely the efforts of the class. It often happens that the teacher gets his mind so fixed upon his own plan or his own idea that he is totally blind to anything of value in the plans or ideas suggested by the pupils. If the pupils are to be trained, their plans and ideas must be the starting point. They constitute the stock in trade, the raw material with which the work must be done. Guided at first by the teacher, and gradually more and more by their own developing experience, the pupils must learn to judge of the value of their own work, their own recitations, their own theories. To be helpful in this respect, the teacher must be on such terms with his pupils that his presence does not stand in the way of free mental activity. A teacher who frightens his class, who is over-serious, or who is sarcastic, will not be able to make much progress in training pupils to study, since his

attitude retards rather than accelerates thinking on the part of the class. Fairness, frankness, the spirit of coöperation, a brisk procedure which brings a sense of accomplishment, — these are helpful to pupils, and experience shows that pupils respond to such qualities in their instructors.

### 3. *The need of training in many directions*

In undertaking to teach children to study, it must be kept clearly in mind that they will not learn the process so as to apply it generally unless they learn it in connection with many kinds of work involving thought. To narrow the training to the reading, arithmetic, geography, or any other one subject will not necessarily produce trained students except in the subject employed. The training must be general if the application is to be general.

### 4. *Consciousness of factors not necessary with very young children*

Another point to be kept in mind in training the very young children is that it is quite as unnecessary and just as time-consuming to make them conscious of the reasons for the various steps in studying as to make them conscious of the reasons for the various processes which they

learn to employ in arithmetic, or for the various correct forms of speech which they are taught to use. They learn to do many things unconsciously in the early days, the reasons for which are wisely postponed until the days of better understanding. The reasons are not always necessary to the mastery of the process, and even though the pupils might be made to understand them, the expenditure of time and energy required with little children is out of proportion to the results obtained. They can learn with much greater ease a few years later, and therefore the rational side of many processes can safely be neglected until that time.

### 5. *Learning to find the problem*

Little children will learn how to study by being trained into right habits of studying by the teacher. In their early oral work in literature, reading, or nature study, the process of training may begin, and as the children gain in power and maturity, more and more may be expected of them. To decide upon the name of a story they have heard requires reflection upon the story as a whole, and judgment as to the most striking characteristics. To find a better title to the reading lesson than the author has given, to find a more interesting

title, or at least to find a different one that is suitable, will require similar effort, and makes a good beginning in mastering thought.

In addition to finding the subject of a lesson and finding its large divisions, young children can be trained to see what question or questions the author has answered in a paragraph or section. Teacher and pupils may work together at this until the latter get the idea, and then a lesson may be assigned to give practice in their new way of working. Children naturally ask questions calling for more information, more facts or more reasons, and need guidance in making choice of such questions for class use. Questions related to the lesson but not answered in the book, or questions growing out of the thought given in the text, should be encouraged, and pupils should be trained to discriminate between those which are valuable and those which are not. They also need to learn how to express the questions well. A seventh grade which had less than a month of this work grew quite discriminating as to the nature and form of questions suggested by the members of the class. These pupils objected to questions as being too long, as lacking clearness, as telling the answer, as being too simple, as being clumsy or poorly worded, and so on. They were giving themselves some excel-

lent training in the art of questioning, and were mastering their texts, since they had to judge of the correctness of the answers given to the questions which they asked. Grades much lower in rank can do something in this direction.

Children can also be trained to analyze a situation or problem and discover what the thing is which is to be known or done, and what the facts are which they can employ in solving the problem. Take an example in arithmetic like the following: A little girl bought two quarts of milk at four cents a pint. How much did the milk cost? When such problems are first begun in class, the teacher asks all the questions, as "What is it that is to be found out?" "What does the problem tell you?" "How can you use what you know so as to find out the answer?" and any other questions that are necessary. But unless the teacher helps the child to help himself, he is likely to remain a helpless dependent. He should learn to make his own analysis. He may even need to write down in one column what he knows and in another what he does not know, and then try to find some clue which leads to the solution. In sentential analysis, in parsing, in arithmetic and other branches of mathematics, in geography, just such opportunities for self-questioning, for analysis of the problem, present

themselves, and unless they are utilized, we shall continue to have pupils in higher grades and higher schools who wait for the instructor to ask all the questions and direct all thought. It is necessary for the teacher to do all or most of the questioning with little children, but pupils of the fourth and fifth grades have demonstrated that they are able to assume much of this responsibility themselves. They need oversight, direction, help in various ways, but it should be help which leads to greater power in breaking up situations or problems and finding right solutions, not help which perpetuates dependence.

### 6. *The function of the lesson assignment*

In this connection, the lesson assignment assumes new importance. It is not merely a time when the pages containing the new lesson are indicated. It is the teacher's opportunity to prepare the class for right study. If the pupils need help in finding the aim, the lesson assignment should pave the way for its discovery. This function of the assignment holds true for all the steps manifestly involved in the mastery of a lesson by a class during a study period. This assignment may occupy a separate period, or it may be made in connection with some lesson out of which the

new lesson develops, and with which it is closely related. Opportunity for the assignment of related lessons occurs frequently and should not be overlooked.

### 7. *Learning to supplement the text*

A form of supplementing the text which little children can begin to use, is the employment of other books upon which they make reports to the class. Or, indeed, the other material may be drawn from any one of many sources; from books, people, observation, or experimentation. But some supplementary assignment, however simple and easy, is given to the class, or to some individuals in the class, and is to be prepared and reported upon in a future recitation. The child becomes responsible for something definite, and his work assumes a new value in his eyes. Whether he is interested in the task for its own sake or does it through a sense of compulsion, he will still be the gainer. The point is that he learns to use outside sources, to cull the material relating to the topic, to arrange it in order, and to give it to the class. As he masters the use of the topical outline, this supplementary work becomes increasingly valuable, for then the pupils' reports are more orderly and reliable. These individual

assignments enable a teacher to save much time for his class, since instead of having all of the class look up all of a subject, he can divide the work, and so get it done more thoroughly and with less expenditure of time by the class as a whole. A certain eighth grade prepares many of its history and geography lessons in the manner above described. When a boy is called upon to recite, he writes his subject and a brief outline upon the blackboard, and then recites to the class, following the order of his topics. The other members may or may not question him. If he has made some important omission, the teacher questions him. He may bring books containing maps or illustrations for the class to examine, and does not hesitate to draw a sketch in a simple way if it is necessary. This work has its beginnings in the lowest primary grades, where the children are made responsible for something which they can easily find out and which they must bring for the benefit of all the class.

### 8. *Judging the value of material*

In connection with the work in supplementing, comes the idea of training pupils to judge whether the information they find or present is true. Little children tell some very surprising things

sometimes, and we often overlook them because we say the narrators have not yet learned to draw an exact line between the real and the imaginary. But when actual facts are called for and these marvelous contributions are offered, the child should be met with the question, "Do you know that to be true or are you making believe?" Even older people have sometimes to reflect that they are dealing with theories and not with facts. Then, too, children frequently read so hastily and so imperfectly that they get the facts of the book quite distorted. They need to be trained to an accurate rendering. In regard to hearsay evidence, they can learn to be discriminating, and to reject the wildly improbable. In many ways which will come to the careful teacher as he looks for opportunity, the pupils in the lower grades can be led to realize that the material which they present must be selected with discrimination, and that it must be true. Reading must be carefully done, observations must be exactly taken, and things heard must be sifted before reports are made. Gradually, as more responsibility is put upon the pupils for the selection of the sources of data, the children ought to be made discriminating in their judgment of these sources. They should consider why one newspaper should be consulted rather

than another; why one historian or geographer should be preferred to others; and why certain people's reports are more to be relied upon than others. If they have been alert and critical in regard to the work done in class from day to day, this new expression of their judgment should not be arduous. Criticism of sources will often come naturally, as, for example, the criticism of newspapers and periodicals of sensational type; of writers whose statements are founded on slight evidences and permeated by an unfriendly spirit. These are only suggestions as to the possibility of training children in the critical judgment of materials. Doubtless the teacher will find many ways of directing and training his classes in proper attitudes toward data and conclusions. Under the criticism which he is led to make of himself, in addition to that offered by his mates, a pupil will gradually learn to refrain from wild guessing, even if he makes no advance on the positive side of sound thinking.

### 9. *Learning to organize data*

While preparing some story for oral reproduction or for dramatization, the pupils can decide which part must be told or played first, which next, and so on. In the third and fourth grades,

this exercise leads to the formation of an outline for a topical recitation or to serve as a guide in composition. In all such work the teacher should guide the children toward being critical of their own titles, topics, and outlines, commending that which is good and pointing out that which is bad with a statement of the reasons for the judgment. The teacher must not demand perfection in these first attempts, but should accept the pupils' efforts without too much correction on his part. As their critical judgment develops, better results can be demanded.

These exercises, begun with material already presented before the class, prepare directly for individual study of books. As the pupils learn the various steps, they should be given opportunity to use them independently with suitable material, and should be tested in class that the progress they are making in their use may be seen. These topical outlines should be prepared independently by older pupils in preparation for class recitation, as a basis for composition, as a convenient means of note-taking, and for any other purpose where a concise and orderly survey of the content of a given piece of subject-matter is necessary. In the higher grades, the use of the written outline may be superseded by

the purely mental outline. Not all pupils may be able to make and hold a topical analysis without notes, but how much they can really do is not known because we have not trained them to use the power they possess.

### 10. *Training pupils to work quickly*

Pupils not only need to master the contents of their books systematically and thoroughly, but they need to master them quickly. There are many students, in school and out, who spend hours poring over subjects which they might grasp in minutes rather than hours if only they had learned the habit of working quickly. Teachers can train pupils into rapidity even with the first oral work in studying, just as they train them into quick recognition of combinations of letters or figures in reading or arithmetic. When the study of books is begun, economy of time can still be insisted upon, and if a class, or individuals in a class, work too slowly, special exercises for increasing rapidity may be employed as in other subjects. Competition of row against row in the time required to prepare a good outline, to find the subject, to find the first large point, and the like, will accelerate effort. The time which is necessary for the whole class to

find the main idea of a paragraph can be noted. Pupils can be encouraged to keep a daily record of the time required to prepare the lesson in the subject which consumes too much time, and to see how much they can lower the time record and still make thorough preparation. The main thing is to rouse their interest and coöperation in the effort to learn to study both quickly and well. Slowness is frequently a habit, and should be replaced by a rate of performance which secures good results in less time. The teacher's thought and ingenuity will help if only he recognizes the situation and determines to improve it. Much of the trouble comes, with adults, at least, from thinking that every word must be inspected. They have not learned to sweep through a paragraph to find the salient thought which it offers and to disregard the rest. Consequently, they waste time and wear themselves out uselessly. Habit holds them slavishly. Those who are taught to study when young may escape such slavery.

### 11. *The value of the puzzle problem*

An important help in training pupils in analysis and in the use of the various steps of study is the "puzzle problem." Such a problem appeals to the natural interests of children. It inspires to

combat, so to speak, and arouses the desire to conquer. The answer is not especially important, however interesting it may be as a sign of victory. It is the intricacies of the process which engage the attention, and challenge one's best efforts. There must be very careful analysis in order to get the exact situation, and means and end must be carefully compared. Such problems used to abound in the old mental arithmetic, and in the miscellaneous problems found here and there in the written arithmetics. The newer books have "puzzle problems" in more practical form, so that the answers have more value; but when in the old books the dog pursued the hare, or the frog crept out of the well, or the proportions of the head, tail, and body of the fish were concerned, the answer had absolutely no value, and all interest centred in the process.

Ordinarily, the practical, every-day problems are best for a class, and should constitute the main part of all applied work. The catch problems, and the less practical "puzzle problems," serve as a stimulus, and can be used occasionally to give zest to the regular work.

### 12. *The position of the answer: its effect upon study*

In this connection, it is not inappropriate to speak of the position of the answer in the book, or in a lesson assigned on the blackboard. If the answer follows the question, an impossible situation is created for the pupils. The pupils are expected to realize the need of the answer and then to find it, — and there it is before their eyes! Why realize its need, and why find it when they already know it? It would be better to have it at the back of the book or in a separate book. Often it is best not to have it accessible at all and to have all pupils prove their work by employing the results they obtain. A class which has easy access to answers is usually a class which is not strong in its reasoning. Such pupils are not at all sure of themselves. They frequently juggle with figures until they get an answer that agrees with the one in the book, but they cannot explain their procedure, nor give reasons for the steps taken. Conditions which lead to such intellectual helplessness and dishonesty should be avoided as much as possible.

### 13. *The number of steps employed in solving any problem*

When the theory of the five formal steps of instruction was first introduced into this country, a number of teachers gained the idea that all of the steps must be employed in all teaching. The result was that the teaching became mechanical and formal, the teachers were greatly and unnecessarily overworked, and there was not enough gain to the pupils to counterbalance the expenditure of energy. If teachers attempt to force pupils to use all of the steps of thoughtful study in the solution of every problem, there will be a similar breaking down of the whole idea. The work will become hopelessly formal and will presently be abandoned. Common sense must prevail; and the nature of the problem, the ability of the pupils, and the materials available for use in solving the problem must influence the steps involved.

It has been shown in earlier chapters that it is necessary to all thoughtful study that there be a problem in the mind of the student. This step, then, the realization of a problem, must be present whether the study be inductive or deductive. Data of some sort must be present, from whatever source obtained, but the amount necessary,

as well as the sources employed, will vary. Sometimes very little organization will be required, while at others there will be need of very careful and comprehensive organization. In solving some problems, the element of doubt may not enter at all as a factor, while at other times there may be need of close scrutiny of both hypothesis and data. Some problems are so simple, and the material attainable is so convincing, that a final judgment may be given quickly; but this is not always possible. It may be necessary to defer for a time a definite conclusion; indeed, final answers are sometimes never possible to the student who first discovers the problem. The theory of world formation is still an hypothesis, though it is long since men first began to reflect upon the making of worlds.

Memorizing, too, will vary. It may not be required at all; the order of the steps thought out may be memorized; the conclusions may be learned in the pupils' own wording; or memorizing may be necessary as in learning poems, rules, definitions, and other forms. It should be based upon understanding, and then carried out with vigor. Close attention and energy devoted to the formal side, after the ideas have been mastered, will make the process relatively easy.

As to verification, there should be enough of it, in some form, to satisfy the problem. In algebra and other forms of mathematics, this verification is carried out by employing the answer found and seeing if it satisfies the conditions laid down in the examples given. In the case of certain social theories, one may point to actual situations as a verification or may follow out imaginary results. *Enough to satisfy the problem* makes a good working rule for verification. In the past, our sins in this respect have been those of omission rather than those of commission. We are more likely to require too little than too much verifying, and to fail in improving valuable opportunities for training in testing results. The consequence is that pupils are left satisfied with very immature theories, and with little or no conception of the necessity and value of proof.

### 14. *The order in which the factors of study are employed*

Either reflection or experience will show a teacher that the factors of proper study will not always be employed in the same order. For example, doubt may be present at almost any stage in the solution of a problem; and some memorizing may be necessary when a part of the work

has been accomplished in order to hold the results already achieved. In working out some long or involved rule or definition by the inductive method, it is often best to work out one part at a time and fix it firmly in the mind before proceeding to another section of the problem. Furthermore, the collecting of data is not limited to a certain place in study. The student may need to search for facts to enable him to define his problem clearly, or to help him formulate a theory for the solution of the problem, or to test the theory when it has been formulated. Hard and fast rules as to the order of the steps in thoughtful study can hardly be laid down. Recognition of the problem has been called the first step, but even this first step may be accompanied by doubt, by the collecting of data, and possibly by some of the others.

Whenever data are employed, the necessity for the exercise of doubt and for organization may arise; and whenever theories are formulated, there may be occasion for decision as to whether the conclusions are final or merely tentative. Naturally, verification must follow the forming of conclusions or theories. The path can only be marked out broadly for the use of the steps, and the conditions present when some individual prob-

lem is under consideration will influence the variations from the path.

To illustrate the variation in procedure, we may think of the problems connected with fishing as they are studied by the pupils who live in the fishing towns on the New England coast and as they would have to be studied by children living inland. The latter would probably have to gather much information about fishermen and fishing before they could even realize the nature of the problems; while the pupils living in the midst of the trade can more easily appreciate them, since they know the situation at first hand. These children of the coast, too, can gather their data from observation and consequently need not suspect their sources of information of being unreliable, as the other class of children might be obliged to do. They are also in a better position to verify conclusions. The whole situation is more favorable for them than for pupils remote from the sea. But when the problem relates to life on the plains or in the mountains, then the situation above described is exactly reversed, and the order of the steps of study would be materially changed for both sets of pupils; also, the extent to which some of the steps would be employed.

### 15. *External aids to study*

There are several external aids to study which pupils should master as they have need of them. One of these is the use of the dictionary. Children should know how to find a word, pronounce it, and select the one meaning which is applicable to the situation in which the word is used. To use the dictionary and pronouncing vocabularies properly, the pupils must know how to interpret the accent marks and also the common diacritical marks. Where several meanings are given, they must learn to choose the appropriate one. If they are looking for the meanings of words to satisfy a conscious need, they will be more likely to choose the correct definition, or the suitable synonym.

A second aid is the table of contents of a book. Pupils looking for material usually need to be trained to use the table of contents, or even to discover its existence. They need practice in finding the appropriate chapter, and then the part of the chapter relevant to the subject which is under consideration. Training in the use of an alphabetical index is also necessary. It is time well spent to teach the use of these various aids, and, when experience shows it to be necessary, to

give special drill in the use of the dictionary, pronouncing vocabulary, table of contents, and index.

The encyclopædia offers a new difficulty because of its exhaustive treatment of various topics. Pupils need to learn how to find the volume needed, the topic in the volume, and the part of the article desired. The treatment of the material when found has already been described, as that is study of content.

When the pupils are old enough to use libraries where Poole's or other annual indexes of current literature are found, a new aid to study must be mastered, and either the teacher or some library assistant should give the necessary instruction. The use of the card catalogue of authors and titles may be learned in the same lesson. All these aids to study are a part of literary life. We frequently assume that knowledge of their use is universal, and consequently give the rising generation no help in processes which in themselves are not natural but must be learned. Training in these external aids greatly extends the power of pupils to acquire new material for themselves, and enables them to work much more rapidly.

### 16. *Hindrances to training pupils to study*

#### a. *Individual differences in ability*

Doubtless many teachers will think that in their particular conditions nothing can be done towards teaching their pupils to study because the obstacles are too great. They may urge as one objection that their pupils vary greatly in ability, and that therefore they cannot hope to give effective training in systematic study. It is not clear why inequality of ability should be a hindrance to training in proper study any more than it is a hindrance to any kind of teaching or training. No class of children have equal abilities in any one line, and yet teachers attempt to train classes in many directions. The objection urged applies equally to all work, and need not prevent training in study, since it does not prevent training in other lines.

Proper study gives the bright pupils a fitting opportunity to use their powers, since they may exercise initiative, search widely for materials, experiment, make reports, and in various ways employ their activities. They derive a benefit from being bright which mere memorizing never bestows. The slower, duller pupils will lose nothing by using their powers intelligently. At the worst,

they can only fall back upon memorizing, a process to which they have been accustomed.

### b. *The limitations of the teacher*

The teacher will find his own limitations to lie in mastering the theory of study, in applying it to his own study, and in teaching others to employ it. But these same hindrances have existed in connection with every advance in method and also in connection with every new subject introduced into the curriculum. They are transient. Not all teachers can learn to train pupils with the same degree of success, but with study and with thoughtful trial, progress can be made. There is no royal road in this special kind of work, any more than there is in others; but the obstacles can be overcome, to a great degree at least, by intelligent, persistent effort. Practice will make it much easier to lead the pupils to see problems and to become more self-helpful in solving them. Furthermore, as the children grow in the use of right methods of study, the teacher's work should become easier and more pleasing. The child will do his share of work and the teacher will be supervising interesting thought, not drilling on barren words.

c. *The tendency to overestimate small points*

One tendency which teachers will need to guard against will be the tendency of the pupils to attach too much importance to small points, to quibble over little things, and to spend too much time upon non-essentials. Because of their immaturity and lack of experience, children lack perspective and so are willing to spend time upon unimportant subjects. Their judgment needs developing. Consequently they need to consider such questions as these: Does the point you are considering bear upon the subject we are discussing? Is it important enough to justify our spending much time upon it? It may be necessary at times for the teacher to sweep the whole discussion aside with the statement that it is not valuable, and to direct the class to the consideration of other data or problems. An experienced teacher, in speaking of the difficulties lying in the way of permitting children to exercise initiative, said that he thought the initiative would have to be directed. He is doubtless right. Somewhere between absolute direction at one extreme, and absolute freedom of initiative at the other, the wiser course will be found.

### d. *The lack of logical arrangement of subject-matter in books*

The arrangement of material in text-books will sometimes be found to constitute a barrier to proper study because the subject-matter is not well organized. Paragraphs are so confused that the author of the book as well as any one else would have great difficulty in writing paragraph headings. There is no logical order but rather a rambling, disconnected mass of statements. It is difficult to use such texts as supplementary material, and still more difficult to use them as sources of problems, since the authors themselves were apparently not aware of any. This lack of organization offers a genuine difficulty to pupils. If texts are selected which are well arranged, some of the difficulty will be overcome. It may, however, sometimes be necessary to use inferior texts because they are the best to be obtained.

When the subject-matter is poorly arranged, the teacher ought to do more teaching and to rely less upon the book. The latter becomes more of a reference book, a source for data bearing upon the problems developed in class. The pupils will be better able to sift out relevant material from a somewhat incoherent text than to discover

problems when the author himself was not keenly conscious of them. Both teacher and pupils are at a disadvantage in using such books, but they exist as sources for information both in school and out, and the best must be made of them.

### 17. *Effect of proper study upon schoolroom procedure*

Any course of procedure which influences greatly the spirit of a school must affect the discipline of that school to a marked degree. Studying for the purpose of satisfying needs, of solving problems, must result in a different attitude towards subject-matter on the part of both teacher and pupils. It involves coöperation and a spirit of good fellowship between teacher and class. Out of these spiritual and mental attitudes must come a kind of schoolroom procedure which is very different from the rigid, repressive discipline which allows no initiative to pupils, and which centres all in the teacher. With the interest of the class aroused, the teacher has less occasion to resort to compulsion or to penalties in order to have lessons prepared. Nor should discipline be so difficult when pupils are working for purposes growing out of their own interests. Pupils will need to have freedom to consult maps,

charts, and books of reference if they are to collect data bearing upon their problems. They may need to learn to do this in a proper way and at proper times, so as to cause as little disturbance as possible to class exercises. Some pupils need to realize that it is often best to find what their own text-books have to say on a subject before they go to the reference shelves for other books. But on the whole, with a working spirit, there will be an atmosphere of work, and that need not be unruly. It is for the teacher to see that energy is not dissipated and that the freedom of a busy class does not degenerate into a state of disorder which makes fruitful effort impossible to those who wish to study.

It has been shown in preceding chapters that the class exercises cannot consist solely of a series of questions propounded by teachers and answered by pupils, or of mere memory recitations of text. There will of necessity be questioning by the pupils themselves, the suggestion and discussion of theory, the weighing of statements made by different members of the class, and, in short, participation in a variety of ways by the class. The pupils should be expected to exercise initiative in discovering and solving problems relating to the school, whether they be problems per-

taining to lessons or to discipline. They require encouragement and training in the wise development of such initiative. It is an important duty of the teacher to meet this requirement. Pupils should be held responsible for the recitations of their mates. They should demand that such recitations be made in tones loud enough to be heard. They should challenge incorrect and irrelevant statements, instead of leaving all criticism to the teacher, who, to be sure, usually assumes it at the beginning of the term and never delegates it. Responsibility should be placed upon the pupils more and more as they develop in ability. Children are not unwilling to exercise activity in the ways mentioned. The difficulty in many cases is that they are not expected or permitted to do so.

A large share of the teacher's responsibility is responsibility which belongs rightfully to the class. This point has already been touched upon in a preceding paragraph, but will bear repetition. The teacher who asks all the questions, finds all the large points, makes all the summaries and outlines, decides whether the problem is solved or not, is doing the work which pupils should do. Children in an average fourth grade can perform many of the activities just men-

tioned. A fifth grade can do still more, and higher grades will be found even more capable.

The field is open for experimentation in these and other lines in teaching children to study. The conclusions and suggestions here presented are based upon observations made in a large number of classes, and some good results have been witnessed. Experience has shown that even a little effort put forth brings a rich reward, though as yet the whole movement is in its beginning. Some teachers of only average ability have tried to train very ordinary classes into habits of systematic study, and have seen most encouraging results within a few weeks; so that no teacher should refuse to attempt to train his class because he thinks that only a chosen few can study successfully. The need of such training is urgent, and those teachers who will grapple boldly with the problems involved in it, who will discover the best ways of working with pupils, the difficulties to be avoided or overcome, and who will put the results of their efforts before the teaching world in some accessible form will be rendering valuable service. For the most part, however, each teacher will have to work out his own devices, based upon the fundamental principles.

In conclusion, one caution is urged upon teach-

ers, and that is that they avoid making this training too formal. One teacher thought the best way to train her class was to teach it to recite the steps of logical study in order. She quite missed the point of the whole idea. If the children learn what the steps are from their frequent use of them, no harm is done; but simply to memorize them makes the whole theory a lifeless form.

It is difficult to write suggestions, because as soon as written they appear very rigid and lacking in adaptability. Let it be remembered that the teacher must read the spirit into what has been said, and that he must not lose touch with it as he teaches. If only he will do that, he will be able to work out much more for himself than the writer has been able to suggest.

### *General Summary*

(1) The teacher who undertakes to teach his pupils to study must regard the subject-matter of instruction as a means of training in right habits as well as a means of acquiring knowledge. (2) He must establish friendly relations with the pupils, and must coöperate with them. (3) The training cannot be confined to one subject if it is to be general in its application. It must be associated with all possible situations. (4) Little

children should be trained to study without consciousness of the method. Right habits are the first consideration with them. As pupils grow older, they may be made conscious of the factors of proper study, so that they may better understand how to direct their own efforts. (5) In the earlier stages of training pupils to study, the teacher will need to work with the class, and he will throw the pupils upon their own resources as their ability to use the factors of study develops. (6) This training will include all of the phases of study at some time, but not all of the factors will necessarily be employed in every lesson. (7) The order in which the factors of study are employed is not fixed. (8) In training pupils to study, the use of such external aids as the dictionary, the encyclopædia, pronouncing gazetteers, indexes, tables of contents, and card catalogues must be included in the process. (9) While various obstacles oppose themselves to the successful issue of training pupils to study properly, very few of them are peculiar to this branch of training, and none are insurmountable. (10) The teacher must accustom the pupils to assume responsibility, to exercise initiative, to participate in the work of the class and school, to ask questions, and to be critical of their own efforts and

those of their classmates. The teacher must to some extent eliminate himself. He must contribute less, and must demand greater contributions from the class. He must perform less of the work, and must train the pupils in thoughtful ways of working.

NOTE. — The following books contain helpful ideas on method of study: —

F. M. McMURRY, *How to Study and Teaching How to Study.*

F. M. McMURRY, "Some Suggestions for the Improvement of the Study Period," *Proceedings of the N. E. A.* 1906.

JOHN DEWEY, *School and Society; Moral Principles in Education.*

W. C. BAGLEY, *The Educative Process*, chap. xxi.

E. L. THORNDIKE, *Principles of Teaching*, chaps. ix, x.

WILLIAM JAMES, *Talks to Teachers.*

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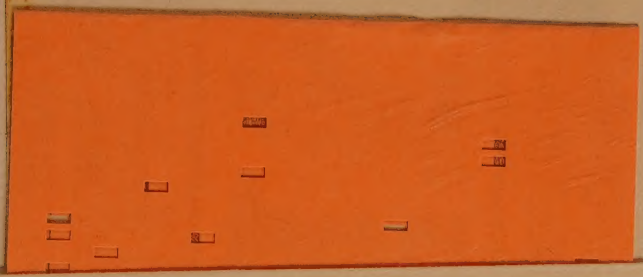

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